REDESIGNING PEOPLE:
TOWARDS A THEOLOGY OF GENETIC ENGINEERING

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The new and rapidly developing rDNA technology which lies at the heart of modern human genetic engineering has provided a new foundation for the science of eugenics and as a consequence it is now more to the forefront of scientific research and public attention than at any time since it fell into disrepute in the 1940’s. The possibilities inherent in human genetic engineering (GE) now available because of rDNA technology appear as both amazing and terrifying. On the one hand there is the hope that thousands of inherited defects and illnesses, simple and complex, will be completely eliminated. On the other hand, there are suggestions of the creation of an animal-human hybrid, a domesticated slave class, or a part human species. While these more extreme possibilities should be discussed, it is unhelpful if the focus falls only upon them because there are theoretical and technological difficulties which may make them impossible and it tends to take attention away from the more immediately realisable therapeutic possibilities. Nonetheless, because rDNA has implications not merely for the physical form of humanity, but also for the intellectual, affective and spiritual nature of the human person the present situation requires a thorough-going theological reappraisal of the foundational issues pertaining to the nature of the person, the meaning of being human and the ethical questions concerning the appropriateness of human "self-creation".

What is needed is a theoanthropology which can interact with, rather than simply provide an alternative to, other approaches to the meaning of the person and the ethics of GE. In this paper I will outline several approaches to GE (the Medical, the Feminist and the Conservationist) in the context of a number of theological principles which, in one way or another, bear upon the nature of the person and the ethics of genetic engineering. Together they provide guideposts for developing an ethic of genetic engineering. If, at times, they seem to point in somewhat different directions it is because of the difficulties of a complex issue.

HEALING THE SICK: THE MEDICAL APPROACH

The most common approach to human GE at the present is the medical. The primary motive for its development is to care for and cure the ill, diseased, and disabled who suffer from some genetic disorder and, as far as possible, to prevent these disorders recurring. There is a whole realm of genetic disorders which have the potential for being treated or eliminated. Estimates vary from 1,500 to 4,000 genetic disorders. The elimination of a disorder takes place by molecular processes which may add, modify or replace a defective gene in the cells of the body.
so that the processes which had previously been dysfunctional now operate correctly. This process can take place in two ways, the first is through the insertion of genetically engineered material into the early embryo (zygote). Genetic manipulation of very early embryos which are shown to have a defect is done outside the womb in conjunction with IVF and ET technology. Although initially it might seem that the treatment of the early embryo, where there are only a few cells to be treated, would be the preferable option, it is in fact unlikely to be used in this way because genetic inheritance occurs according to statistical patterns and in most cases some progeny will be unaffected by the genetic disorder, and given that IVF technology is obviously being used there is little point in modifying a defective embryo when unaffected ones are available. Rather than going to the trouble of correcting embryos it makes more sense simply to implant ones that test as being unaffected by the disorder.

In this case it seems that the second possibility, post-natal treatment, is likely to be of more use in treating genetic disorders. This involves the introduction of genetically engineered material into the relevant part of the body, for example by injection into the blood stream of a sufferer of haemophilia or thalassemia, of genetically engineered cells which will multiply to the point where there are sufficient to overcome and permanently end the disorder. Certain bone marrow disorders can be eliminated by the removal, genetic treatment, and replacement of bone marrow. Some hormonal problems including the absence of somatostatin (a rare brain hormone needed to overcome the effects of diabetes, gastric bleeding and other disorders) and growth hormone (without which dwarfism occurs) can also be overcome relatively easily. The point of these treatments is that the new material will continue to reproduce itself and so it is not a temporary alleviation of the disorder but a permanent change to the body. It must be emphasized that not all genetic disorders will be as easy to treat, bone marrow and blood disorders have the advantage of having cells which are more easily targeted but in the case of other diseases almost every cell in the body would have to be treated. To deal with this problem experiments are taking place with viruses (viral vectors) which would carry the required genetic material throughout the body. It is not known precisely what will be able to be done but it is certain that over the next few years there will be a great increase of GE solutions to genetic disorders.

The treatment of genetic disorders by the use of this technology is the agenda of the medical approach to GE. The fundamental dynamic is the desire to heal, a dynamic which clearly has a strong Christian dimension. It would be a continuation of the strong Christian medical tradition to encourage the use of GE for these purposes. However, if pursued without regard to other considerations it may prove to have unhealthy effects as well. GE may mean the advent of "designer babies", the detailed selection of genetically engineered children. This would parallel the development from purely therapeutic to cosmetic surgery where the emphasis shifts from rectifying medical problems to creating a desired, socially acceptable, effect. Only now, the possibility arises for both far more radical changes and for effecting it for all future descendants. The problem lies in not having any means of determining when to stop. What rationale is there in the medical approach (apart from technological and financial considerations) to prevent any genetic change which is deemed to be desirable? The absence of any characteristic which is socially desirable can ultimately be deemed to be a 'disability'.

The problem is illustrated by reference to the treatment of growth hormone deficiency which causes dwarfism. The absence of the normal growth hormone produced by the pituitary gland which causes dwarfism can be overcome by the introduction of laboratory produced, genetically modified bacterial material. Without this genetically produced growth hormone the only
alternative treatment is to gather the hormone from the pituitary glands of cadavers, a process which takes 50-80 cadavers in order to provide for one year's growth treatment for one child. The undoubted benefit of the genetic solution is offset by the problem of some parents wanting the treatment for their children who do not suffer from dwarfism but who are likely to be shorter than average. When is the absence of height a genuine disability and when does it become a matter of cosmetics? What if everyone wants to have children which are above average height? Is it appropriate to allow treatment of any perceived problem or only of genuine disabilities? What is a disability?

It is the desire to incorporate (literally!) additional characteristics which is more likely to lead to GE of early embryos because this is the stage at which it would be the easiest to make some fundamentally new change, that is, to attempt to enhance the genetic structure of the individual. In this situation there is no problem to rectify (and therefore no 'better' embryo to choose from), rather it is a case of deciding that this individual (and perhaps subsequent descendants) would be better off with some completely original characteristic. This is enhancement engineering. The positive, caring and healing dynamic of the medical approach carries with it problems that are unlikely to be resolved by remaining with that approach alone.

**MALE AND FEMALE: SEEKING THE SOCIAL DIMENSION:**
The Medical approach to GE is not the only one, feminism is another. Feminism in the 1990's is not monolithic and involves a range of views on GE and medical technology. Not all contemporary feminism is as negative towards the new technologies as the feminism of ten years ago. Nonetheless, the various views have some common characteristics and it does provide an approach which is distinctive and helpful. The fundamental aim of this approach seems to be to recover a social, 'human' perspective to GE and this involves a strong tendency to view the unrestricted use of any reproductive technology as a continuation of the process whereby men continue to control women in accordance with the current discriminatory, domineering and unhealthy sexual and social attitudes. For example, it is argued that IVF reinforces the attitude that women must be fertile and mothers if they are to justify their place in society; that IVF success rates are blurred in order to continue the process while concealing the danger of substantial physical and emotional problems for women; that infertility research has focussed unjustly on diagnosing and treating women's infertility (compared with that of men) thus blaming women for infertility and again emphasizing the child conceiving, bearing and rearing role of women while down-playing that of males; that all reproductive technologies industrialize and technologize society in an unhealthy way; and now that eugenic intentions will lead to discrimination against the disabled and reinforce social prejudices. For example, "The eugenic nature of such research and its subsequent application to humans only serves to reinforce prejudices against those with disabilities (genetically caused or not). Looking to the future, the technologies will undoubtedly be used in sexist and racist fashions as well." In the artificially assisted birth process there is already evidence of the selective use of donors to eliminate undesirable features and discrimination against females through sex selection procedures. The more advanced eugenic possibilities of rDNA may lead to the non-selection of those with any sort of deformity or the positive selection or creation, if need be, of only those who possess what is perceived to be an ideal or perfect form. This process of selection can easily become a search for the ideal and may result in the enhancement of discrimination against those who already possess 'undesirable' features. Just as the non-selection of females in the process of sex selection says something about social attitudes towards males and females, does choosing not...
to have certain features (or choosing to select certain ideal types) effectively devalue all existing people with such features?

A purely technological approach to GE produces the real danger of de-humanizing society. The feminist awareness of the social dimension of living and the way in which GE is likely to affect social relationships is a healthy corrective to the medical-technological approach and involves a theme which must be of interest to Christian reflection. Humanity is created as a social species. "So God created humankind in his image, in the image of God he created them; male and female he created them." (Genesis 1:27) Claims that the new reproductive technologies are biased against women and against accepted social patterns must be taken seriously and investigated if we are to avoid GE being a perpetuation of the curse laid upon the woman: "...and he shall rule over you." (Genesis 3:16)

The social approach to GE, while involving a critique of the use of reproductive technologies, has nothing in it which necessarily requires the complete cessation of the use of all technologies. Consequently, it has the potential for being blended with the medical approach in a way that avoids what are seen as the indiscriminate, male-orientated and de-humanizing aspects.

**MADE IN THE IMAGE OF GOD: THE UNIQUENESS OF HUMANITY**

There is, however, one significant area, traditionally of interest to Christian thought, which the feminist viewpoint has sometimes had difficulty dealing with because its incorporation appears to run contrary to the social rights of women which is the very dynamic on which the feminist view which is predicated and it has meant that there has been a reluctance to attribute any significant moral status to the embryonic subject of GE. To emphasise the rights of the human embryo in any real way seems to detract from the rights of women to control reproduction. Thus this feminist view is seen as running counter to the "fetalist" view which bases all decisions concerning GE and other reproductive technologies on the sanctity of human life and the status of the embryo.

What a fetalist approach does is to view an embryo as an unborn child and say it's criminal to experiment on unborn children. To my mind, an embryo is obviously growing tissue which belongs in the body of a woman and she must be the only one who has something to say about that.¹⁷

If the endowment of the right of women to avoid being treated simply as the subjects of new technologies completely eliminates the rights and value of the embryo then it seems that there is a need for the introduction of a new dimension to that approach. This new dimension is also required in the face of suggestion that it would be appropriate to use the new technology to produce a sub-human slave class. For many people such suggestions are clearly objectionable but there are always difficult areas: precisely what degree of change is permissible? What ought be said about the situation where there is no genetic disease or disorder and yet there is a desire to genetically engineer a person in order to produce some new characteristic which it is deemed desirable for an individual, a group of people or for all humanity?¹⁸ Is the currently normal human susceptibility to lead poisoning a 'disability' which ought to be engineered out of the human constitution? If muscular dystrophy can be eliminated is it then appropriate to engineer in extra muscle to benefit those whose muscles have not developed satisfactorily, and if so can it only be done for health reasons or also for aesthetic and cosmetic motives or perhaps to develop sporting prowess? There are many people who would like to change the shape of their bodies, and there are many creative minds that could think immediately of a hundred ways of altering our
human form in order to gain some advantage of pleasure or economics. Finally, how appropriate
is it to make some genetic change by crossing species? Technology has already come to the point
where the first animals with human genes have been produced. Cancer research has a need for
animals upon which to experiment and so human genes have been introduced into mice to make
their physiology more closely resemble that of humans. This has produced the (fully patented)
oncomouse. Is this appropriate and more particularly, is it appropriate to make some change
humanity by the introduction of animal genes? These questions force us to think more on the
basis of the belief in the unique status of humanity and on the theological foundation for that
belief.

The statement that humanity is made in the "image" of God (Genesis 1:26; 5:2; 9:6) must mean
that in some sense humanity has been made to resemble God. More precise definition than this
has met with the accusation that each interpreter simply attributes to the concept meaning which
is appropriate to the anthropology of their own age. The significance of this term for a theology
of GE can, however, be realized by a brief examination of the general range of possible
interpretations.

The first class of possible interpretations understands that it is in the 'soul' or some 'spiritual'
capacity or quality that we resemble God. This interpretation begins with the incorporeality of
God as a fundamental principle and whether the precise nature of the likeness is determined to be
in the soul or in rationality or in original righteousness or in dominion of the natural world or in existential relationships, it is usually the case, by implication at least, that the body is not
in the image of God. Without having space to trace the entire history of this movement the
inevitable result of this is some form of anthropological dualism with body and soul understood
as two substances able to exist independently. While this ancient view is still attractive to
some it is not easy to make the sharp distinction between 'body' and 'soul' which is required.
Apart from the fact that the Bible seems to be very reluctant to speak about humanity being made
up of two, distinguishable, separable, independently existing parts, experience itself tells us that
the state of our bodies affects our spiritual or 'soulish' life. We are an integrated unity, body and
soul together, and if this is so, can it be right to exclude the physical form from the concept of
being in the image of God? While it may be trite to interpret the image as being present simply
in the upright posture of the human species Gerhard von Rad makes the point very strongly that
interpretations "which proceed from an anthropology strange to the Old Testament and one-
sidedly limit God's image to man's spiritual nature" are to be rejected. "The marvel of man's
bodily appearance is not at all to be excluded from the realm of God's image". A physical
interpretation of the general concept of image is to be found in Gen.5:3 in which Seth is
described as being born in the image and likeness of his father. It would seem that the reference
is to there being a physical resemblance.

The tradition that the image of God can only be found in the incorporeal nature of the person (or
of humanity as a whole or in human relationships) has been given tremendous impetus in the
modern era by the generally dualist tendency of most philosophy and theology which has been
the legacy of that line of thought extending back to Descartes and Kant. Descartes replaced the
apparently unnecessarily obscure Scholastic theory of matter as potential with the description of
matter as extension, so that the phenomena of this world are best described as geometric
substance. He then postulated that mind, or soul, was a second distinct and independent
substance which interacted with the physical. The tendency ever since has been to split body and
soul/mind and to treat the latter as the real person and the former as non-essential and as of lesser
value. The division of the person into two parts has seemed helpful to those who operate from the perspective of immortality but a dualist interpretation of life after death is not the only orthodox possibility and from the point of view of the ethics of the person it is most unhelpful in that it inevitable undercuts the value which ought to be attributed to the body. It is simply not enough to credit value to the body on the basis of it being either a God-given and useful (but fundamentally non-essential part of the person), or on the basis that it has value just as any part of the natural world. To speak of humanity as being in the image of God requires that we say something more than this. The importance of our physical form for us should not be underestimated. Nor is it the world as a whole which is in the image of God, but the human person alone, who necessarily appears and exists in physical form. The value of the human person, is dependent upon being in the image of God and not simply upon being part of the world. The special moral status associated with being in the image of God is indicated in the covenant with Noah, "Whoever sheds the blood of man, by man shall his blood be shed; for God made man in his own image" (Gen.9:6). Humanity is therefore in a unique position and the human person may not be dealt with as simply an object of this world or subordinated to other human interests. Any changes to the whole human person through changes to the physical (and the intellectual and affective and ultimately spiritual) form are of particular concern. The danger with GE lies in the extent and nature of the changes which can be made.

The conclusion is that the uniqueness of the person, understood in terms of being in the image of God, ("to be human and to be in the image of God are not separable") means that there is a case against changing the human image. A warning or marker buoy has been set up which it is hazardous to ignore but while some people would prefer to stop here and prohibit the use of GE but this is not the only marker we have. There are other factors to be taken into consideration and some of them take us in a slightly different direction. While it is certainly wrong to use knowledge in destructive ways it is also a mistake to consciously move towards ignorance.

**CALLED TO BE ADMINISTRATORS: THE RESPONSIBILITY OF HUMANITY**

Sometimes it is argued that GE puts humanity in the position of 'playing God' and making decisions concerning life, death and the form of human life which are God's perogative and that therefore research into GE should be abandoned. The appropriate response to this is that humanity 'plays' a role in the management of this world a role which is explicitly given by God (Gen.1:28) and symbolized in the right to name the animals. Humanity, being in the image of God is able to represent God and exercise His control and dominion. This description of humanity as God's representatives who are able to exercise 'dominion' means that there is a sense in which we are required to 'play God'. This is not to be understood in any trivial way, but humanity is to represent the authority of God in this world as his vice-regents, his representatives. The world does not belong to humanity though, people are only stewards, not owners, of God's earth. Understood in this way, the world's genetic inheritance is not humanity's, it belongs to God along with all the rest of creation. It is given in trust to humanity, which therefore has a responsibility to administer it along with every other part of this creation.

Given this role and the reality of the situation, the question is not really whether we ought to change the world by 'playing God' for in fact we are constantly doing that every day in thousands of ways (many of which are 'technological'). There is a sense in which humanity has always controlled life, death and, to some extent, genetic selection, through 'natural' means and all rDNA technology does is provide an extremely sophisticated refinement of this. In fact, the real question is how we will change the world and the obvious point is that not to utilize rDNA
technology is to allow the sacrifice of many endangered species as well as to condemn many people to the continued suffering of significant genetic diseases and disorders. Viewed in this way the appropriate administration of GE may be seen not as a threat but as a responsibility given to us by God.

This responsibility can be exercised in at least one significant way which would limit the use of GE. A very important distinction which must be noted concerns the inheritance of characteristics given to an individual by the process of GE. All body cells can be divided into somatic or germ cells. Germ cells are those cells which form ova and sperm and then embryos. They are able to 'germinate' and produce a new organism. Somatic cells comprise all other parts of the body other than the reproductive cells and they can only reproduce themselves within the organism. While all cells contain sets of chromosomes only germ cells are able to divide so as to provide half of the genetic material for a new individual. When somatic cells divide they simply reproduce themselves with exactly the same genetic data as before. This means that while changes can be made to the somatic cells of a body in order to correct (or enhance) the physical characteristics of that individual, such characteristics will not be inherited by progeny. Only when germ cells are engineered will the changes be able to be inherited. Obviously, germ cell engineering has far greater significance than somatic cell engineering and it may be responsible to decline to use it at present.

MADE FROM DUST: BEING A PART OF CREATION
Reference was made earlier to the medical and feminist approaches to GE and now it is appropriate to mention a third identifiable approach which is that of the conservation movement. The main focus here is more upon GE in the animal and plant world than the human realm, but this approach still contributes a useful and necessary theme. The environmentalist approach can be summed up as 'conservationist' - a term which may be interpreted in two ways, both of which provide useful lessons. First, there is the reminder of the need for a 'conservative' approach in the sense of being cautious and moving ahead slowly. In a field in which development and implementation can follow each other very rapidly, even before the full, and possibly permanent, implications can be determined, it is important to remain cautious. Sometimes what is at stake in GE will involve the whole future of humanity. This caution acts as a warning to the enthusiasm of many who approach GE from the medical perspective.

The second meaning of 'conservative' is that of seeking to preserve or conserve the whole environment and seeing all the parts and the wholeness of the world as important. With respect to GE the fundamental aim is to ensure that any changes are ultimately commensurate with maintaining the existing genetic inheritance of the world. The onus of proof is shifted onto the prospective users of new genetic material to demonstrate that there will not be any damage to the environment. The end result of any engineering must be able to be shown to be 'benign' or 'not damaging'. Genetic engineering should not be seen as simply another means of subjugating the natural world or of exploiting it at the expense of losing parts of it. GE should not become the means whereby genetic diversity is diminished. The introduction of genetically engineered species of plant or animal (or human) life ought not be done so as to overwhelm naturally occurring species or characteristics of species. It is well known how the past examples of the introduction of species into new environments has sometimes led to a distortion of the ecology and the loss of other species. GE, if not used conservatively, has far greater potential for the elimination of the world's genetic heritage.
As we come to reflect on Christian attitudes to GE it makes a lot of sense to learn from the environmentalist approach which is based upon a recognition of human responsibility for the careful preservation of the world. A theme which clearly relates to the Christian principle of stewardship of the world. In Genesis humanity is described as being made from the 'dust' of the earth (Gen.2:7). This very simple statement tells us that it is a mistake to see humanity as fundamentally separate from 'the natural world'. The environmentalist approach reminds us of this truth. Unfortunately, the idea of a sharp and almost fundamental separation between humanity and the world was given great impetus in the modern world by the 'new science' of Kepler, Galileo and Newton, which, as interpreted by Descartes led to the idea of a mechanistic view of the universe. The attitude which developed has been called 'scientific materialism' - the conviction that the ultimate facts of nature are bits of matter in space - and this mechanistic view has meant that the natural world has been viewed as a tool to be used and manipulated by people who stand apart from it as the users. The obvious truth though, is that we are part of the world. Our bodies consume food and water and they 'become' part of us. The atomic constituents of our body once existed as some other part of the world and at some stage in the future will do so again and every seven years we undergo a complete change of body cells. That we have a common heritage with the rest of creation is seen in the fact that about 98% of our genetically determinative DNA is the same as that of apes. Obviously the 2% difference is very important, but we do stand in a line of continuity with all creation. Biblically this is expressed in the statement that we are "formed from the dust of the ground" (Gen.2:7). While the principle concerning the image of God stressed the uniqueness of humanity, now the focus is upon the continuity of humanity with the natural world which, it must be remembered, is also 'good'. The whole of the created world is 'good' (Gen.1:31) not merely humanity and for this reason the entire world, the whole cosmos is to be redeemed (Rom.8:19-22). That we are a part of the world would seem to suggest that while there must be restraint in the use of human-animal GE, there is no absolute theological prohibition upon such a practice, for being in the image of God does not require complete separation from the rest of the natural world.

'A LIVING SOUL': THE HUMAN CAPACITY FOR GOD

The Christian belief in soulishness indicates that people are neither just animals nor robots but beings who are able to relate to God in a unique way. We can enter into a personal relationship with God in a way that rocks, plants and animals cannot. Traditionally, the human capacity for God has been expressed in the language of the soul, it means being a person who can interact with God and with other people. Humanity is made of earth but it is particularly of humanity that "the LORD God...breathed into his nostrils the breathe of life; and man became a living 'nephesh' ('being' or 'soul')" (Gen.2:7). It is this which is distinctive of humanity and which expresses the capacity for relationship implied in the phrase 'image of God'. The concept of the soul has often been interpreted in a rigidly dualistic manner, but it is possible to agree wholeheartedly that it is the soul, or the soulish nature of humanity which enables this relationship, without forcing a dichotomy between 'body' and 'soul'. It is as whole, living beings that humanity relates to God and to speak of human soulishness is not to speak primarily of some separable part but it is to speak of that life, vitality and character of a person which is unique, transcending purely vegetative and animal life. Theologically, the presence of the nephesh means that people are not only the product of their environment ('dust') and therefore not simply of their genes either, but are unique in God's creation. The question which is raised by GE is whether this will be challenged by the claim that what was thought to be unique human behaviour is in fact the product of genetic programming. What are the implications of the suggestions that GE can
transform not only the human physical form but also the intellectual, affective and ultimately spiritual characteristics of an individual or even a species? Does this eliminate real humanity and place us with the animals? This challenge must be taken seriously. Is it possible to dispense with the concept of God and with the soul because genetic engineering now opens up the possibility of creating people who are more or less loving, kind, generous or peaceful? Or perhaps more angry or aggressive or docile, depending upon what is believed to be required. Do we have people who are not really free agents but simply the sum total of their genetic inheritance? All this cannot simply be dismissed without consideration, the pioneer of reproductive technology, Professor Carl Wood has suggested that it might be possible to modify personality characteristics, such as reducing human aggressiveness, and Professor Bernard Ralph, former head of the school of biology at the University of New South Wales has warned of the possibility of modifying human genes to create a class of people "who never ask questions and does just what it is told. This would be quite possible...in domestic breeding of animals we breed out the savage characteristics to get the most docile of cows...theoretically you could do this with humans."

This comes very close to genetic determinism, sometimes called sociobiology, which is particularly associated with E.O.Wilson, and which, in its more extreme form, is a form of behaviourism (pioneered by B.F.Skinner). It implies that because each person is genetically determined that therefore their actions are the results of irresistible, predetermined biological data. Because it does not allow for human freedom, sociobiology is usually discredited by theologians as simply being reductionist and determinist. Wolfhart Pannenberg, in his magisterial Anthropology in Theological Perspective dismisses sociobiology in half a page after finding "enough to invalidate a reduction of cultural systems of human behaviour to the explanatory principles of sociobiology". But the sociobiologists are not put off so easily and have been prepared to moderate the earlier and more extreme expressions in favour of more moderate expectations which nonetheless still anticipate the possibility of significant modifications in human behaviour. In addition to this there is a desire to address the relevant theological issues from a sociobiological point of view. Models for sociobiological theology exist in process theology, or, more generally, in what Charles Lumsden calls prosaic theology, ...a systematic presentation of faith that writes such concepts as God, soul, and grace, in terms of material events or processes...Prosaic theologies swallow science whole, arranging its ideas into definitions of divine being and a life of faith.

Sociobiology is seen as the way of unravelling the mystery of genetic effects upon brain, mind and human behaviour. DNA has become the 'icon' of this research, the unifying feature which gives coherence to the facts of reproduction and patterns of inheritance. Molecular theory is the modern focus not only for chromosomal behaviour and protein synthesis but also for Darwinian and Mendelian theory and it is seen as the key to future eugenic manipulation. The accuracy of this ambitious anthropological theory is already being tested in debates about genetic influence on intelligence and it will be examined even more thoroughly in the next decade or so as more and more genes and their effects are identified. It is felt that a complete mapping of the human genome is possible within several decades. As this progresses the extent to which it is necessary to recognize biological causes of behaviour will become more apparent and while it may not be as straightforward as some geneticists expect, nor will the findings necessarily be exactly what theology has traditionally wanted.
While scientific discoveries of the past have not provided a convincing case for disposing of the concept of God, they have on occasions caused substantial changes to the form of theological thinking. Lumsden's interpretation of the revolution which he believes sociobiology will produce requires a revision of traditional theism and a change from a model of God as a personal being acting upon the world to a more immanent understanding of God at work in the processes of the world, a model extrapolated from notions of scientific law, such as A.N.Whitehead's process theism. The identification of God with natural law leads R.W.Burrhoe to say, "It makes little difference whether we name it natural selection or God, so long as we recognize it as that to which we must bow our heads or adapt" but Lumsden, while agreeing that God/god is to be understood in this way disagrees about the implications, "The god/God of prosaic theology might, one hopes, never warrant our worship." Whatever the implications for worship theology is transformed if God is simply the working of DNA. Nor will theological anthropology be left unscathed if human personality and will is revealed to be only the result of genetic inheritance. Eaves believes that we may need to revise the notion of sin in the light of what we learn about our biological heritage and of course the whole matter of human freedom and the meaning of will, choice and decision is altered. The whole form of theological thinking is changed, god is not really God and humanity is not really human.

Will GE require this kind of change of thinking, this radical change to anthropology? It is very unlikely that it will. Those principal and distinctively human, affective, volitional and intellectual characteristics such as love, anger, will and intention which are the basis of any relationship are unlikely to be controlled by GE. However, they may be open to being affected via a process of interaction in much the same way as any individual reacts to, and is in part the product of, their physical form. An individual born with a disability may respond to that disability in numerous ways. While it may be said to affect them, perhaps producing frustration or a bitter character, the disability itself does not determine the reaction. It could involve instead a greater appreciation and thankfulness for physical health, and thus the disability could contribute to a very different personality trait. The disability does not determine the reaction. If we take as another example, an optimistic eugenic program which aims to eliminate undesirable attitudes such as 'hate' or 'anger' from the human character. Logic tells us that this is attempting the impossible. The appropriateness of these sort of attitudes is related specifically to their context. That is, while hate and anger can be good and proper attitudes, in certain circumstances it is right to hate evil and to be angry at injustice. To be angry is not necessarily contrary to love, we may be angry precisely because we love (God or justice or our neighbour who is suffering injustice). In other words to eliminate anger is to eliminate love because the two are connected. To eliminate anger is not to modify the human character, it is to destroy it! Any genetic process which eliminates anger has effectively 'killed' the person - even if there is still a body. It is possible that technology will find new ways of killing people - there is nothing new in that! - but it is by no means certain that rDNA technology will be able to produce in humans the forms of eugenic modification of personality that are sometimes expected, or feared. Relationships and responses are functions of people and not simply of biochemistry. Behaviour is not reducible to biology. At this stage there is no need to assume that there is an analogy with the eugenic modification of animal behaviour. It is not necessarily the case that docility in humans has the same cause as docility in cows.

If these personal functions are not only to be understood in terms of genetics (though there will certainly be some influence) then the essential nature of humanity - the ability to respond to people and to God, especially to God, is not predetermined for us by our genetic heritage. Our spiritual nature is not simply our DNA. While GE may produce situations which will give rise to
various possibilities, it is unlikely that the essential human, relational characteristics will be directly controlled by GE.

This is not to say that there will not be areas of new discovery, and for some time, areas of controversy. For example, researchers believe that they are close to identifying the genetic cause of manic depression, but to discover the genetic cause may not be to discover everything. To what extent is this genetic disorder affected by environment and the attitude of the individual? To make a comparison with a situation of a rather more trivial nature, a stone in a shoe may cause irritation in one individual but it may not in another because of a difference in attitude. In the case of a more serious and distressing injury or disease it is not unreasonable to anticipate and empathize with a greater degree of frustration, irritation and perhaps anger, but even here some people will not experience any of those feelings. It appears though, that manic depression, may be one of a type of genetic disorder which differs from other disorders or disabilities in that it appears to operate more directly on the emotional nature of the person. But does this mean that it is completely unlike the other situations and is not influenced by environment or individual responses? Does it mean that there are some disorders to which we may respond and others which are determinist in their effect? Even if manic depression is entirely genetic, to deal with it would be only to deal with one of many causes of depression, many obviously not genetic.

Conclusion
In drawing together the material covered it seems necessary to conclude:

(1) That DNA is not completely determinative of human life. Behaviour is not reducible to biology. The development of human GE is therefore unlikely to develop the more extreme possibilities which have been suggested. Not only are there technological problems which may be insuperable but there are also logical problems with the belief that GE will be able to produce direct and radical changes to human personality or relational capacity.

(2) On the other hand, the fact that we are embodied people, a unity of interconnected physical and psychical, means that our genetic inheritance, which directly affects the physical and which may indirectly affect the psychical, is of the highest importance. It must be recognized that DNA encodes certain unique, potentialities which determine human form and functioning and which therefore indirectly provide some of those capacities which are utilized in developing human relationships with God and other people. Therefore we are left with the fact that GE still has tremendous theological implications and difficult ethical problems which will require further analysis. The relationship of DNA to the human person may become a source of debate which will replace the debate concerning the relationship of brain to mind/soul/person.

(3) In terms of the present application of human GE we must conclude that there is no theological reason for seeking to absolutely ban the use of the technology. But there are plenty of reasons for carefully restricting its use and for being very cautious in its application.

(4) At the very least, human GE ought to be restricted to somatic cell therapy so that the risks and the effects, both known and unknown, will be limited to the individual involved and will not be inherited and become part of the human gene pool.

(5) Human sinfulness not only requires constant watchfulness and the positive promotion of only those changes which will contribute to human life but it is also necessary to produce
legislation to prohibit the more trivial, unhelpful, selfish, abhorrent or in any way de-humanizing uses of this technology.\(^6\)

(6) It is necessary to balance the therapeutic potential of GE against the social dangers of the marginalization or manipulation of certain groups in society.

(7) Finally, GE must be seen in a global context and the economic cost of its development weighed against other social and economic problems. If we consider the problems of the third world we may have some reservations about the appropriateness of the cost of the development of certain forms of GE if it is used for continuing and increasing the already inappropriate levels of affluence and comfort which only part of the world enjoys, or if it is to become a process used only for 'enhancing' humanity according to socially determined ideas of what is 'desirable' in the human form.

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1 It is also referred to as gene surgery, gene manipulation and molecular genetics. rDNA or ecombinant DNA (deoxyribonucleic acid) technology is the manipulation of the DNA which is the chemical present in the nucleus of each cell which determines the genetic form and functioning of the body.

2 Eugenics seeks to improve the genetic structure of human race by controlling reproduction.

3 The initially optimistic eugenic movement which began late last century fell victim to racist interpretations and in particular its abuse at the hands of Nazi Germany through experiments with human breeding programs, mass sterilization, euthanasia and genocide. All were aimed at eliminating the 'unfit' and developing a 'superior' people.

4 Bernard Ralph, former head of the school of biology at the University of New South Wales warns of the possibility of creating a docile slave class, and ethicist Joseph Fletcher has supported the creation of part-human species. Proposals for human-gorilla (or chimpanzee or orangutan) hybrids (or 'chimera' - after the mythological animal made up of the front of a lion, the middle of a goat and the rear of a serpent) are made in the Australian Journal of Biological Sciences 35[2]. [All cited in Anthony Fisher IVF: The Critical Issues, (Melbourne: Collins Dove, 1989) 209]. Mice chimeras, formed through fusing two embryos were created in 1965 and work has continued on mice-rat and goat-sheep chimeras (Nature, Vol.307:634-638; also see Thomas A. Shannon, What are they Saying about Genetic Engineering? [New York: Paulist, 1985] 76-770. It may be too early to speak with any precision about human-animal hybrids but there are too many people interested in the prospect to assume that it will never be investigated or attempted.

5 It also has unfortunate overtones of that not uncommon attitude which views technology as a tool with which it is appropriate to manipulate the natural world into the service of a comfortable, affluent and dominant minority.


7 Theoanthropology is a convenient shorthand for 'theological anthropology' which is itself an alternative to the traditional but cumbersome (and sometimes gender exclusive) 'doctrine of man/humanity'. References to (for example) 'theoanthropological ontology' are marginally more convenient than 'theological anthropological ontology'.
Such as achondroplasia (a form of dwarfism); glaucoma; hypercholesterolemia (high cholesterol levels with a propensity to heart disease); polydactyly (the presence of extra fingers or toes); Huntington's chorea (the progressive degeneration of the central nervous system); sickle cell anemia (most sufferers die by the age of 40); Tay-Sachs disease (a progressive brain deterioration); cystic fibrosis (which affects about 1 in 2500 and is thus one of the most prevalent of the potentially fatal disorders. Only about half the sufferers live to 20 years of age); PKU syndrome (a deficiency of an essential liver enzyme, which leads to mental retardation); muscular dystrophy; haemophilia. There are also many disorders which are even more complex in their origin, diseases which are the result of the interaction of a number of genes such as spina bifida, diabetes, hypertension and atherosclerosis. There are also chromosomal disorders which involve either damage to the chromosome, which may have contained perfectly appropriate genes, or the presence of extra or rearranged chromosomes. Down's syndrome is the result of there being three (instead of two) number 21 chromosomes.

Genes are sections of DNA threads which can be 'cut' out by the use of a 'molecular scalpel' known as a restriction enzyme. The DNA can be recombined in the desired pattern and then reinserted into the body. A simple description of the process may be found in David Suzuki and Peter Knudtson, Genethics: The Ethics of Engineering Life, (Sydney: Allen and Unwin, 1989) 114-140.

That is, in vitro fertilization and embryo transfer technology, now routinely used in the treatment of infertility.

However much progress is made we cannot ever hope to eliminate all defects. Apart from there being a current lack of information and technology, there are many defective genes in existence which do not necessarily affect the people who carry them but which may affect their descendants. New defects are also continually arising. Moreover, many genetically caused problems are complex polygenic disorders and the elimination of them might also eliminate other desirable characteristics.

For a fairly negative approach to the technologies see, for example, any issue of the journal, "Reproductive and Genetic Engineering: A Journal of International Feminist Analysis" (Pergamon Press). Also see Gena Corea et al, Man-made Woman, (Hutchinson, 1985); Gena Corea The Mother Machine: Reproductive Technologies from Artificial Insemination to Artificial Wombs, (New York: Harper and Row, 1985); Renate Klein The Exploitation of a Desire: Women's Experiences with in vitro fertilization, (Geelong: Deakin University Press, 1989). For a more sympathetic approach see Lynda Birke, Susan Himmelweit and Gail Vines Tomorrow's Child: Reproductive Technologies in the 90's (London: Virago, 1990). In feminism, as in each of the three approaches described here, I have not intended to provide a comprehensive analysis but merely to point to the main value and the main danger of three motives which have led to three broad approaches to GE.

The examples are from Marilyn Born and Renate Klein, "Reproductive Technologies: A Feminist Perspective" (Unpublished interview).


Fisher 208.

In India and the UK (see C.de Wit and G.Corea, "Current Developments and Issues: A Summary" in Reproductive and Genetic Engineering, Vol.1, No.1, (1988) 95 and also Australia (Fisher 210).

Born and Klein 4 and J.Scott (ed.) The Baby Machine: Commercialization of Motherhood, (Carlton: McCullock, 1988) in which Janice Raymond argues that "fetalists offer no critique of the reality that the new reproductive technologies impose on women and on real women's bodies. It is almost as if real women do not exist in their (fetalist) view or that the only real women are those who are willing to become mothers".

Even if we distinguish in theory between 'negative' (or 'therapeutic') and 'positive' (or 'enhancement') eugenics and permit the former and prohibit the latter, the problem remains for what is enhancement for one person may be seen as corrective to another. (Negative eugenics is engineering aimed either at preventing the development of disease or disability or at treating people who have inherited diseases in order to eliminate the disability. It is also referred to as 'corrective' eugenics, 'euphenics' or 'therapeutic engineering'. Positive eugenics is aimed at the enhancement of the
individual, not correcting a defect, but modifying genetic material to obtain what is perceived to be a desirable change It is sometimes known as 'elective' or 'enhancement' eugenics.

19Meaning a duplicate or replica or sometimes an idol (1 Sam.6:5; Num.33:52; 2 Kings 11:18). The term 'likeness' is a likeness of something in a more abstract or analogical way. (Ezek.1:5,10,26,28). See Gerhard von Rad Genesis, Revised Edition, (London: SCM Press, 1963) 57-58.

20This is expressed by Calvin who said that God's image is the "inner good of the soul" (Institutes 1.15.6) and "Now I understand by the term 'soul' an immortal, yet created essence, which is his nobler part. Sometimes it is called 'spirit' (1.15.2).

21Athanasius, De Incarnatione, 3.

22Dominion is more likely to be the consequence of being in the image than the image itself.

23The suggestion that our being in the image of God is not found in our ontological structure but is to be found in existential relationships and specifically and typically in the relationship of male and female was put forward by Karl Barth (Church Dogmatics, [Edinburgh: T.and T.Clark, 1958] Vol.111, Part 1, 183-206). This has the great advantage of at least appearing to be suggested by the parallelism of the relevant passage of scripture. (Gen.1:27) This understanding suggests that we are related to God, or, we are in his image, in that we are relational beings just as God is inherently (trinitarianly) a relational being. Whatever else this may imply it does at least bring us back to physical characteristics because maleness and femaleness is, at least in part, physically determined.

24Part of the attraction of this dualist view is the analogy it produces which helps explain the action of God in the world, Aquinas says, "We find a certain imitation of God in man...in that all man's soul is in his body, and again all of it, in any part of the body, in the same sort of way as God is in the world." (Summa Theologica 1a.93.3).

25Expressed in a definitive form by Augustine, "If you wish a definition of what the soul is, I have a ready answer. It seems to me to be a certain kind of substance, sharing in reason, fitted to rule the body" On the Magnitude of the Soul, 12.22. Also see The City of God, 13:2.


27The debate on this is quite extensive and while there are still defenders of traditional anthropological dualism, more and more, either holistic or at least less sharply dichotomous alternative is being preferred. While there is evidence of both unity and duality, Hebrew anthropology fundamentally involves a synthetic unity. It is not absolutely monistic but involves a modified holism with a unity of aspects. On this debate see W.D.Stacey, "Man as Soul", The Expository Times, Vol.72, 349-350; Ludwig Kohler, Old Testament Theology, 142; W.Eichrodt, Theology of the Old Testament, Vol.2, 131; A.R.Johnson The Vitality of the Individual in the Thought of Ancient Israel, (2nd Ed. Cardiff University Press, 1964).


29Von Rad, 58, NB: The context indicates that 'excepted' is to be preferred to 'expected'. Also see W.Eichrodt, Theology of the Old Testament, Vol.2, 122-125.

30Clines, 57-58.

31Eg J.W.Cooper in Body.

32And may turn out to be the least helpful, there is substantial truth in the statement that Christianity speaks of the resurrection of the body (or person) rather than of the immortality of the soul.
33 If it is, partly in the body that we resemble God, does this imply that God has something which correlates to a body? The traditional and strong conviction that God is bodiless has meant that this understanding of the imago dei has not been a popular option, though in some theological circles the possibility of God being 'embodied' in some sense in the world is being seriously promoted. See A.N. Whitehead, Process and Reality: An Essay in Cosmology (eds D.R. Griffin and D.W. Sherbourne; New York: Macmillan, 1929), and for a more recent defence G. Jantzen, God's World, God's Body, (Philadelphia: Westminster, 1984).

34 Clines, 101.

35 See Shannon 15-20 and also Agius 109.

36 At the end of the eighteenth century some people resisted Edward Jenner's smallpox vaccinations on the basis that it is better not to have that knowledge and if God wanted people to have smallpox then that was his prerogative. It is hard though, not to see the need and the correctness of gaining knowledge in order to benefit humanity even though knowledge can always be misused.

37 I have reservations about describing our role as co-creators with God. It is a term I have used in "Embryos, Experimentation and Incarnation" in Colloquium, (Vol.21, No.2, May 1989) but we do not create in the same way that God creates, even thought we may modify and alter, the power of life is God's alone. The use of this term may be understood in an orthodox way indicating the moderated creative ability we have or it may derive from neo-theistic attitudes where God and the world are more closely bound together than traditional theism has allowed and which thus grants a more substantial creative role to humanity.

38 In exercising this control the technology associated with GE can play a tremendously beneficial part in preserving the genetic inheritance of the world's life forms which are being lost at the rate of 10,000 species per year! This estimate of the loss of species is only a rough one because it is not accurately known how many species there actually are. It seems that less than 2% of the earth's 5 - 30 million species have yet been properly identified. Noel J. Brown, "Investing in Our Future" In Future, Vol.10, (Melbourne: The Commission for the Future, 1988) 12.


40 Two notable examples of this 'conservative' approach are the Australian Conservation Foundation (whose position is expressed in Policy Statement No.45, "Genetic Engineering" October 1989 and the very well known Canadian geneticist David Suzuki and especially his Genethics: The Ethics of Engineering Life, (Sydney: Allen and Unwin, 1988) which is co-written with P. Knudtson. Also see Philipp Schmitz, "An Ethical Look at Agricultural Biotechnology" in Concilium: Ethics in The Natural Sciences, 127-137.

41 As regards the agricultural use of GE we should note that the first releases of genetically engineered organisms have already taken place in Australia and overseas, see de Wit and Corea, 96.

42 D.G. Jones illustrates some of the dangers of moving too quickly in a related area in Brain Grafts: Parkinson's Disease, Fetuses and Ethics, (Bramcote: Grove, 1989) 116.

43 Australian Conservation Foundation, Policy No.45, section 1.

44 Schmitz, 133.

45 Whether it be rabbits, carp or prickly pear.

46 One problem of this conservative approach lies in determining the degree of proof or confidence that one can reasonably have or expect to have that the release of a certain genetically engineered organism will not damage some part of the environment.
There is one underlying problem with the central dynamic of the environmentalist approach and it concerns the problem of finding a rationale for treating humanity as fundamentally unique in terms of value and moral status. The more extreme forms of environmentalism do not have any means by which to establish the uniqueness of humanity. Environmentalist fundamentalism promotes a misanthropic view which denies any significant or particular stewardship role, rights or responsibility to humanity in favour of seeing humanity as the cause of most of the world's ecological problems. Dave Foreman, of the U.S. ecologist group Earth First! says, "The human race could go extinct, and I for one would not shed any tears". In "Ecoapocalyptics" by Brian Tokar The New Internationalist, (No.210, August 1990) 14. While this misanthropic view is not present in Peter Singer's arguments for refusing to be "speciesist" the extreme environmentalist approach can draw upon that philosophy which denies any 'arbitrary' belief in the unique moral status of humanity. Peter Singer, Practical Ethics, (London: Cambridge University Press, 1979) 48-71.

The extent to which species will be able to be crossed is by no means certain. See Suzuki 265-289.

It may be said that the human person is a nephesh/soul rather than that a person has a nephesh/soul. For example, H.W.Wolff, Anthropology of the Old Testament, (Fortress, 1974) 10; R.Laurin, "The Concept of Man as Soul" in Expository Times, 72, 131.

It is not uncommon for the claim to be made that advances in modern science somehow disprove religious faith, this occurs in other related contexts, such as in discussions of the so-called creation of life through in vitro fertilization. Because of developments in IVF it is said that "the view that life is a 'sacred process' (initiated, sustained and finally halted by God) is now difficult to maintain." H.Kuhse "An Ethical Approach to IVF and ET" in W.Walters and P.Singer (eds), Test-Tube Babies, (Melbourne: Oxford University Press, 1982) 22-23.

Carl Wood, The Sydney Telegraph (5.7.81).

Bernard Ralph, The Melbourne Age, (30.3.87) this and the previous reference are both cited in A.Fisher, 208-209.


They are also ready to go on the offensive against theologians' interpretations of genetic science, Lindon Eaves doubts that Pannenberg's anthropology is 'modern' enough. See Lindon Eaves, "Spirit, Method and Content in Science and Religion: The Theological Perspective of a Geneticist" in Zygon, Vol.24, No.2 (June, 1989), 203.


Lumsden 88.

That is, a unifying theme, almost a physical representation of a whole body of theory. See Eaves, 193-196, on the way DNA has become the central focus of the geneticists' dream.

A project to map the entire human genome (ie.to determine the genetic significance of every gene) has begun in the USA. The Department of Energy is providing resources to a number of laboratories. C.de Wit and G.Corea, "Current Developments and Issues: A Summary" Reproductive and Genetic Engineering, Vol.1, No.1, 98.

A fuller version of this reads, "The god/God of prosaic theology might, one hopes, never warrant our worship. But under the circumstances of its existence it most certainly warrants our love." While Lumsden is right that the God/god of prosaic theology does not warrant worship because it is not really God, it is necessary to disagree with him and say that neither does it warrant love. How can this impersonal god warrant such a personal response as love?

Perhaps our current range of adaptive social responses reflects where we have come from biologically and is still "out of step" with the norms proclaimed in the Judeo-Christian tradition. This gap between the givens of our biological ancestry and our cultural present may be part of the reality that is known theologically as "original sin". Eaves 206.


We should note that because complete safety can never be guaranteed, GE research needs to promise significant benefits over risks. The danger of the unknown effect should particularly be considered in the context of germ line genetic engineering. It is possible to go too fast and if human GE is to be used it should only be if there is no acceptable alternative treatment.

Regulation will always be needed "because of its confidence in the redemptive possibilities of human activity, the church will tend to think that regulation is possible; because of its awareness of the demonic potential of human activity, it will insist that regulation is necessary". (Schneider 95).