

August 1995

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Recommended Citation

Sutton, Agneta (1995) "The New Genetics: Facts, Fictions and Fears," *The Linacre Quarterly*: Vol. 62: No. 3, Article 11.
Available at: <http://publications.marquette.edu/lnq/vol62/iss3/11>

The New Genetics: Facts, Fictions and Fears

by

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Not content to be created in the image of God, man has always wanted to be His equal. Recognizing that he has a free will, man has always known that he has special powers, powers such as no other mortal creatures have. But just as the Greek drama portrays the pitfalls of man's hubris, so too does the Bible tell us that we must beware of usurping the prerogative of God and must stop before the tree of the knowledge of good and evil. That is to say, we must recognize that it is not for us human beings to play God, seeking to steal divine powers or deciding for ourselves what is good and evil, right and wrong.

Yet today with the advances in gene-technology, we may seem close to the realization of our ambition to become not the keepers of the universe but its supreme masters. Indeed, we are close to unveiling the highest secrets of alchemy, which is not a recipe for making gold but one for making designer-made children. Together, our new reproductive and genetic techniques go a long way towards satisfying the ambitions of the 14th century experimenter, astrologer and magician Johannes Faustus, whose greatest ambition it was to create a homunculus — a man-made man — the crown of alchemist creation. A thought as worrying as fascinating! Worrying because it would mean producing humans as artefacts. Fascinating, because it would mean power, an unknown and marvelous power with possibilities we cannot even fathom.

For those who believe in God there can be no doubt that God's laws are there for us to follow and that some things really are wrong and that there is such a thing as objective moral truth. Limited as we are, thanks to our rational and God-like nature, we are, if we try, capable of recognizing what is right and wrong. We are indeed graced with special gifts and so are much more clever than any of the animals. But with our abilities come responsibilities, responsibilities for this world and all its creatures including ourselves. Today this responsibility is indeed widely recognized, even among people who do not believe in God or see our responsibility as delegated by God. Ecology is a big issue and rightly so. Today, with our new advances in science, it is more important than ever to take our

responsibility as the stewards of this world seriously and consider where this responsibility begins and where it ends. This is particularly true in the area of medicine, where, as our knowledge and our technical abilities increase, it becomes more and more difficult to decide how rightly to utilize our new-found powers.

Since the subject matter of this paper is genetic engineering and the rightful limits of the new gene techniques, the question to be considered is what we as the keepers, not the supreme masters, of the earth may or may not justifiably do in this new area of medicine.

At present, scientists all over the world are trying to map the human genome, that is to say, map the building stones of the genetic blueprint for the species of man. It is probable that within ten years molecular biologists may have broken our entire genetic code. Already we know how to detect many hereditary diseases by means of our new technologies. At present, since there are few cures for these illnesses, this knowledge is used mainly in prenatal testing with a view to aborting children suffering from grave disease. Nevertheless, the hope is that one day this new science will enable us to find cures for hitherto incurable diseases, which would be wonderful, provided the new therapies have no undesirable physical side-effects or unfortunate moral implications.

Genes

What, then, is happening in this new area of medicine? In order to answer this question it may be helpful briefly to remind the reader how genes work.

The human genome consists of some 50,000 to 100,000 genes. These are located on 23 pairs of chromosomes, themselves consisting of long molecules, so-called DNA (deoxyribonucleic acid) molecules, which means that, physically, genes are segments of DNA. Their function is to provide instructions for the production of different proteins and for controlling when and how much of a protein is made in what cell-type or tissue. A change in a gene, a mutation, brings about a change in the manufacture of the corresponding protein. This may cause a problem, that is, a genetic illness. As genes come in pairs (because chromosomes come in pairs) and, provided one of them is normal, the resulting function of the pair is usually normal. But sometimes a dominant gene takes control, resulting in the production of a harmful product. Huntington's chorea is such a dominant condition. In the case of recessive conditions, on the other hand, both of the genes in the pair are faulty, their combined malfunctioning resulting in a failure to produce a certain protein. The thalasemias, sickle-cell disease and cystic fibrosis are recessive conditions.

Genetic conditions inherited on the X-chromosomes are also recessive. This is why males, who inherit only one X-chromosome (from the mother — their other sex-chromosome being a Y-chromosome, inherited from the father), need just one bad gene to be affected, while females who have two X-chromosomes (one from the mother, the other from the father) rarely are affected. Duchenne muscular dystrophy, haemophilia and color blindness are X-linked conditions.

Other genetic conditions, multifactorial conditions, are caused by the combined function of a number of genes together with environmental conditions.

Heart disease and cancer are of this type.

With the help of our newfound DNA techniques it is now possible to detect a rapidly growing list of genetic conditions. We are also on the verge of finding gene therapies for some of these conditions.

Testing

To start with testing, we may distinguish between three kinds: prenatal diagnosis, carrier testing and predictive testing.

Predictive testing

We may speak of predictive testing when children or young adults are tested with a view to predicting the likelihood of their developing a certain disease in the future. The kind of conditions that will be candidates here are multifactorial conditions such as heart disease and late onset single-gene conditions, such as Huntington chorea, for the last-mentioned tests are already available. It is noteworthy, however, that in the case of many conditions, especially multifactorial ones, it will be hard to know exactly to what extent the individual will be affected.

It goes without saying that this sort of testing could pose all sorts of problems. If a child is tested for a dominant condition such as Huntington's chorea and is found to have the gene, it means that one of its parents also has the gene and will fall ill in the future, if he or she has not already done so. It also means that any sister or brother of that child, as well as any sister or brother of the affected parent, has a 50% chance of having inherited the bad gene. Such information is not always welcome. Relatives of affected individuals may not necessarily wish to know that they, their children and parents, may be at risk. Conversely, an affected individual may not wish inform relatives of his problem, although they might have found such information helpful in planning their lives. There are problems about confidentiality here; and there are problems about relatives' rights to know and not to know. There is also the problem of giving consent to such testing in the case of children; and linked to this there is the problem of whether or when the child should be informed about test results. At a certain age the child may have a right to know, but would it really like to know? Moreover, if employers or insurance companies providing health care cover or life-insurance were to demand such testing, discrimination would be inevitable. And in many cases, this discrimination would be based on tests of poor predictive value in regard to exact prognosis.

These are important issues with important implications for personal rights and personal integrity, but they do not essentially entail new and different attitudes to life and death, to our children or to procreation. It is not, then, in this area of screening that the changing frontiers of medicine threaten to alter our perception of ourselves and our children as truly human and possessing a special dignity. However, the other types of screening, carrier screening and prenatal screening, cannot but have long-term social consequences involving our attitudes towards our children and our understanding of ourselves as human.

Carrier testing

Starting with carrier testing, it does have implications bearing on the understanding of human life and our place in the world. The main difference between predictive testing and carrier testing is to be found in the purpose of the tests. While predictive testing is performed primarily with a view to predicting the future health of the tested individual, carrier testing is performed with a view to finding out whether the individual risks passing on a hereditary condition to his or her children. This sort of testing, then, which might be used in the case of certain chromosomal, as well some recessive and dominant single gene conditions, is performed in order to help couples to make so-called informed reproductive choices. It is mostly applicable to recessive conditions, such as the thalassaemias.

In Cyprus, where people are particularly prone to thalassaemia, it is the practice to test all young people to see whether they are carriers of this disease. If a man and a woman wish to marry they have to produce a certificate showing that they have been tested. This is to make sure they know whether or not they are carriers. If both of them are carriers, any child they conceive has a 25% chance of inheriting a bad gene from each of them and being affected. Should the woman become pregnant, she will be offered prenatal diagnosis to enable the couple to "avoid the birth of a handicapped child".

This shows that carrier testing is not a mere means of obtaining information, but is potentially a tool for implementing certain measures of population control. It could be used, then, to implement certain restrictions on people's right to marry. Such restrictions, which would concern marriages between two people who together risk passing serious genetic disease, would constitute a serious infringement of what is in our society a generally recognized right, namely the individual's right to marry and found a family with a partner of his or her choice.

Carrier testing could also be used as a preamble to prenatal diagnosis, as is the case in Cyprus. It is claimed that recourse to prenatal diagnosis in Cyprus is absolutely voluntary. But one cannot but wonder whether the establishment's vigorous encouragement of the testing program does not constitute a certain pressure on the individual couple to abort "affected offspring". Such a pressure would encourage the view that children are disposable and replaceable — a view which is totally incompatible with the understanding of children, born and unborn, as members of the human family, possessing the same human dignity as the rest of us, and so the same fundamental human rights, the most basic one of which is the right to life.

Prenatal diagnosis

Prenatal testing has been around for several decades. But with improved ultrasound screening and the development of the new DNA techniques since the 1980s, the number of detectable fetal conditions have been rapidly increasing.

As to the moral issues, if the purpose of tests is to determine the health of the unborn child in order to guide the management of pregnancy towards a safe delivery, there is no problem. But most prenatal testing is undertaken for eugenic purposes, that is to say, in order to avoid the birth of a handicapped child. It is

widely assumed that it is better for its parents, for society — and even for the child itself — that is not born, if affected by a grave structural defect such as spina bifida or by a chromosomal condition such as Down or a genetic illness such as thalassaemia, Duchenne's muscular dystrophy or cystic fibrosis.

The Catholic Church has, however, always considered abortion a grave sin. This was so in the early Church and remained true even in the Middle Ages and early modern times when many theologians believed in delayed animation and, therefore, would not describe early abortion as homicide. As to abortion of a fetus thought to be ensouled, this has always been regarded as homicide by the Church. But even the abortion of a fetus not thought to be ensouled was always considered gravely wrong, because it meant interfering with the beginnings of human life and thwarting divine designs.

Today, in the light of modern embryology, which testifies to the fact that human life is a continuous process initiated at conception, it is difficult to deny that the life of each one of us begins at conception and that from then onwards there is a human person, who remains the same individual human person throughout his existence. For if the organic process is a continuous one, as it clearly is, then it is hard to see how the developing entity could somehow, at a certain point in time, change nature from a mere potential human being or person to a real human being or person. If I am a human person now, then I must surely have been a human person since the time my bodily life began at fertilization, when a new entity came to be, an entity with powers and potentials quite different from that of the sperm or ovum taken separately, an entity not only of human origin and alive but intrinsically capable of developing into what I am now.

It is true that the Magisterium has not yet affirmed immediate animation or said explicitly when the embryo or fetus becomes ensouled. But, to quote from the 1987 document, *Donum Vitae*, even if "no experimental datum can be in itself sufficient to bring us to the recognition of a spiritual soul; nevertheless, the conclusions of science regarding the human embryo provides a valuable indication for discerning by the use of reason a personal presence at the moment of this first appearance of human life: how could a human individual not be a person" (*Donum Vitae*, I.. 1)? The Church, then, while not actually affirming immediate animation, is now certainly hinting at it.

The one situation in which it may be difficult to see how human personal life could begin at conception is when the product of conception develops into two identical twins. However, it should be pointed out that this type of twinning is very rare and the same in all human population, namely a mere 0.3% of all live births. It is therefore peculiar to a very small percentage of embryos, and so, contrary to what has been suggested by many, mono-zygotic twinning provides no objection to regarding the vast majority of embryos as individual human beings from the time of conception. Moreover, the fact that the frequency is the same in all population groups and does not vary from one year to another indicates that it is genetically determined. This means that if the embryo twins, this is because it contains a gene programming that there should be not one but two individuals, and so in a sense there are already two individual presences in

such an embryo. If this sounds strange, consider the case of Siamese twins. Their situation is similar.

But, for the sake of argument, assume that the twinning is not genetically determined and that the embryo that will twin is truly one individual. Surely, it is still human and alive, and so deserving of the same respect as other embryos? As for the question of what happens when it splits, if the zygote is just one individual, we might understand the twinning process as a form of asexual reproduction on a par with budding, in which case one twin is an off-shoot of the other. This would mean that one twin began life at conception, while the life of the other began at the time of separation. Surely, even in this situation each twin deserves to be respected from the time its life begins.

In short, even in the case of twinning we would have to admit that from the time of conception there is an entity quite different from a sperm or an ovum. Provided this entity is not accidentally or intentionally destroyed it will develop into a mature person — or to two or more mature persons. It, therefore, deserves to be respected and protected as a person, and so abortion at any stage must be regarded as seriously wrong.

No arguments for abortion

However, we live in a society where the prevailing ethos is of a utilitarian cast and where the notion of sanctity of life has lost its meaning, largely because many people no longer take religion seriously. Not surprisingly, then, most people see nothing wrong in abortion, at least not if it is done for the sake of the mother's well-being or for the sake of society or out of pity for the child itself in view of, say, its foreseeably poor "quality of life". Let us briefly consider these arguments.

To start with the argument based on the assumption that some lives are of such poor quality that they are not worth living, this is indeed a curious one. Yet, often it is the prospective parents themselves who voice such thoughts, saying that if the child were to suffer from a grave handicap, it would be better for it not to be born. But how can anyone presume to say that it would be better for another person not to be born, especially when there is no way of consulting that person about his or her feelings about the matter. In addition, a person born with certain handicaps is bound to have very different expectations from someone who is born healthy. And more importantly, since life is a precondition of ever experiencing or achieving anything at all in this world, to take the life of a fetus is to deprive it of any possibility of ever experiencing any human affection or any other form of communication with others.

As to the argument that a handicapped child is a burden on its family, it may well be that a child born with a grave congenital defect would be a burden on its parents. And, it is always regrettable when a child is born with a serious illness or deformity. But it is also true that such children can give a lot of pleasure, as well as sorrow, and may enjoy life in their own way. Moreover, it is a fact that psychiatrists and councillors are becoming increasingly aware that abortions may have adverse psychological consequences - not least abortions on grounds of abnormality. The mother who undergoes prenatal tests to see whether her baby is

well normally wants to have her baby. For her to be faced with bad test results and confronted with the question of abortion is tragic. The natural response to a termination for abnormality is grief. Sometimes the mother manages to suppress her feelings. Sometimes her grief only surfaces many years later - triggered, perhaps, by the birth or death of another child or some other event involving children. But never does the mother feel no regrets at all.

Regarding the argument that the child would be a burden on society, there is no doubt that large-scale national screening programmes, set up in order to reduce the number of births of disabled children, are to a significant extent influenced by purely financial considerations. Such children may need special medical care and special schooling. This costs money. But the value of human life is not pecuniary, it is of a different order altogether.

Of course, apart from this consumerist and utilitarian attitude to human life, another influence at work shaping current screening programmes, and social attitudes to the same, relate to ideologies about breeding certain types of humans and avoiding the births of others. This sort of thinking is no novelty, but was to be found already in Plato's *Republic*. But the origins of current reasoning concerning prenatal screening — as well as some of the aspirations in connection with gene-therapy — lie closer in time and are to be found in 19th century and early 20th century thought, with the two most notable influences having been Malthus's population theory and Galton's theory of eugenics. While Malthus's theory has encouraged what might be called negative eugenics aimed at avoiding socially undesirable births, that of Galton has amounted to a call for positive eugenics in the form of selective breeding or the achievement of systematic genetic changes in individuals or their offspring with a view to promoting certain types of human.

Now, many advocates of selective abortion would argue that prenatal eugenics will in no way influence attitudes towards more mature disabled people. But they delude themselves. The underlying rationale of prenatal screening is that the disabled are a nuisance, and so the practice is bound in the long run to undermine the position of the disabled and promote a less tolerant society — one where people may even be punished, financially or otherwise, for bringing imperfect children into this world and where the survival of the fittest is the order of the day. Prenatal diagnosis is bound in the long run to have serious effects leading to a much less tolerant society generally, one in which none of us may feel secure if disabled, old or infirm.

Finally, it is, of course, also true that prenatal diagnosis with a view to selective abortion is contrary not only to Christian thinking but the antique Hippocratic tradition of medicine adopted by Christian physicians from the earliest times. Since, the traditional Hippocratic aim of medicine has been to heal, and, if that is not possible, to provide palliation, one of the main principles of Hippocratic medicine has been to avoid causing harm. Diagnostic procedures in keeping with this aim of medicine would promote the health and well-being of the patient whose health is being examined. But if prenatal diagnosis with a view to selective abortion is part of medical care, it is an exception to this rule. It is not aimed at promoting the health of the unborn child but at getting rid of it, should it be

suffering from some undesirable condition. Of course, prenatal diagnosis also involves pregnant women. But they are not the focus of the investigation. There are two patients here, and if the standard rule of medicine were followed, the main purpose would be to promote the health of the one who is being examined. Hence, even if selective abortion is beneficial for women, which is doubtful, current screening practice is beyond the pale of traditional medicine.

Gene-therapy and Single-gene Defects

The question now to consider is whether some forms of gene-therapy are not also beyond that pale. We talk of two types of gene-therapy: *somatic* and *germ-line*. While somatic cell gene-therapy involves the correction of genes within somatic cells, that is cells other than ova, sperm cells and their precursors, germ-line cell therapy involves precisely the cells of the germ-line, i.e. ova, sperm cells and their precursors as well as the cells of the early embryo not yet differentiated into germ-line cells as distinct from other cells. Whereas the former type of therapy affects only the individual patient treated, the latter kind of therapy affects future generations.

Somatic gene-therapy

Somatic gene therapy with a view to curing or alleviating a single-gene condition of a particular individual is already a reality, but only in the case of recessive as opposed to dominant conditions. This is because recessive conditions are the result of two non-functioning genes; and the kind of gene-therapy presently being developed involves the insertion of missing healthy genes into appropriate cells, there to stimulate the production of a missing protein, and so cure the patient. A cure for a dominant condition, on the other hand, would require the elimination of the dominant disease-causing gene in a gene-pair. This is not yet technically feasible, but no doubt one day it will be.

The first successful attempt at gene-therapy was performed on a four-year-old girl in September 1990 (at the National Institute of Bethesda) in Maryland. The girl suffering from ADA deficiency (adenosine deaminase deficiency), a rare and until now incurable recessive immune deficiency. At present, gene-therapy trials are under way with cystic fibrosis patients. And it may also be noted that the new gene-techniques have wider therapeutic possibilities than the correction of single-gene disorders and may soon be used to treat several forms of cancer.

Moral issues

As to the ethics of somatic gene-therapy, it should be noted that it is no different, in principle, from conventional types of medical treatment; it is but another, if novel, way of seeking to cure individual patients. It does not raise any novel moral issues, but here as in more conventional types of therapy, what is at issue is the risk to the individual patient. But the risks are considerable; we do not yet know the long-term consequences of this use of viruses or other mechanisms to ferry genes into different tissues. We cannot exclude the possibility that patients treated by such means later on in life may develop cancers or immune system problems. Yet, provided we proceed with the utmost caution, the developments

in somatic gene therapy do offer new hope to people affected by fatal or seriously debilitating diseases for which there are no other cures.

Germline gene-therapy

Germ-line cell therapy, on the other hand, is fundamentally different from conventional treatment. It is intended to cure not only the individual patient but future generations. This means the risks involved concern not only the individual treated but also his offspring. Here we really do have to consider the question of where to draw the line between interference that is, and interference that is not, in keeping with our duties as responsible and respectful keepers of the earth and all its creatures, including ourselves.

Here, then, there is a lot more at stake than solely medical risks — and these are serious enough. To start with the risks, the price to be paid for any mishaps would be high, since these would be hereditary and transmitted from one generation to the next. Furthermore, germ-line therapy means treating or subjecting future generations to today's techniques, techniques which may seem crude and simple by tomorrow's standards. Of course, it is hoped that if germ-line therapy is achieved, it might rid mankind of some diseases altogether, or at least rid many families of certain diseases. However, there would always be new mutations, and some of the old diseases would turn up *de novo* in new generations. In addition, some of the disease genes got rid of might carry information for other traits than the disease we wish to eliminate; some good traits might be lost in the process. And by depleting our common gene-pool, we might genetically impoverish future generations. Because of these medical risks, then, there is at present a world-wide moratorium on this kind of therapy.

Apart from the risks just mentioned there are certain other important moral considerations to bear in mind. Some of these concerns relate to the fact that most, if not all, germ-line therapy would involve extra-corporeal conception. The Catholic Church has always urged the utmost respect for human life from the time of conception. But extra-corporeal conception inevitably entails embryo selection and, hence, embryo-wastage. No embryo deemed unfit for life would ever be implanted, and if there were several to choose from, only the best (one, two or three) would be chosen.

Moreover, the Congregation for the Doctrine of the Faith, in *Donum Vitae* of 1987 (Instruction of Respect for Human Life in its Origin and on the Dignity of Procreation), has ruled out, even within marriage, all forms of reproduction not initiated by the bodily union of man and woman. This is on the ground that it is incompatible with the dignity both of the couple and of the child-to-be. Procreation by-passing the sexual union of man and woman denies the essence of their natures as male and female, complementary and created for each other and new life. Only the sexual embrace of mutual commitment and self-giving and of unconditional and faithful acceptance can be a truly worthy setting for the beginning of a new human life. This is the only setting fostering an attitude of full acceptance of the child and of true parental generosity and commitment. The child so conceived is begotten, not made, of one being with its parents. By contrast, when the child is procreated by means of IVF or similar techniques, the

process turns into a form of production with the result that the child comes into being, not like a gift received, but like an artefact ordered to specification or bought in the medical super-market or consulting room. Indeed, the child which is made, not begotten, is the belated realization of the aspirations of Johannes Faustus, the 14th century magician and alchemist.

Even if it were to become possible to perform germ-line therapy not involving extra-corporeal conception but, say, early treatment of normally conceived embryos in the womb or of germ-cells before natural fertilization, and even if the risks could be minimized and the technique were to enable us to cure some hitherto incurable diseases, allowing people who could not otherwise have healthy children to have them, it would still remain a moot point whether this type of therapy is morally permissible. Germ-line therapy means exercising a new form of control over future generations. Even if our intentions were the best, what right would we have to do so?

One important question is whether the individual has a right to an unchanged genetic heritage? Could we envisage a genetic change that would eliminate a serious disease such as cystic fibrosis or Huntington's chorea within a certain family? And could we justify genetic alterations affecting the personality of future individuals? Then there is the question of consent. Would it be right for parents to give consent to alterations affecting not only their own child but their grandchildren and their great-grandchildren?

The main question at issue is really whether using germ-line therapy means making "designer babies", and therefore threatens to foster a producer & consumer attitude towards children. When people start asking for babies with — or without — certain qualities, there is the risk, the social and moral risk, that the value of children will be measured in units of health and performance quality, social utility and parental satisfaction. That is to say, there is the risk that their intrinsic value and dignity as human beings, as our neighbours and fellow images of God will tend to be forgotten.

Enhancement Genetic Engineering

The social and moral risks of designing babies becomes clearer in the context of so-called enhancement gene-therapy — techniques, intended not to cure people of illness, but to improve them in other ways by making them better looking, more artistic or more intelligent or athletic.

Enhancement genetic engineering need not involve germ-line therapy but could conceivably be restricted to the individual child, that is to say, the individual infant or child in the womb. That would avoid the risks related to hereditary alterations as well as the moral issues related to extra-corporeal conception, but the designer aspect would remain.

To focus then on the designer aspect, and more particularly on the idea of improvement, it is no novelty to use medical procedures for non-curative or cosmetic purposes. And it may be argued that, since parents normally have a right to make decisions concerning the health of their own children, it would be inconsistent to forbid them to choose enhancement genetic engineering for them. What could be wrong with improving one's childrens' athletic or mathematical

performance — or beauty? But the analogy between cosmetic surgery and enhancement genetic engineering should not lead one to conclude that because some forms of cosmetic surgery are justified some forms of enhancement genetic engineering would be.

First, we might distinguish between quite arbitrary non-perfective interventions, on the one hand, and perfective interventions on the other. Most people would probably reject the idea of arbitrary non-perfective interventions to satisfy the whim of the individual couple wanting a baby with certain characteristics, such as blue eyes and blond locks. However, some might argue that certain traits or characteristics are objectively better than others. The traits in question would probably be those relating to intellectual ability and physical performance. However, the suggestion that we might agree on which traits are objectively superior to others, is as naive as it is dangerous. It may indeed be true that some traits are objectively better, that is better before God, than others. But when people disagree about the ranking of different characteristic, who is to decide which ranking is the right one? Whose choice is to prevail?

Also, it should be noted that a person's personality depends on all his intellectual, emotive, affective and other mental and spiritual characteristics working together. Who are we to alter this inter-play? What could possibly make anyone think that it is for us to decide that it would be better for a child to be given a certain gene conferring on it, say, greater mathematical or musical ability? The hoped for mathematical or musical genius may turn out to be devoid of all feeling or to be a Frankenstein monster. If there is something particularly disturbing about the idea of seeking to determine or design the very personality of a child-to-be, is this because we intuit that we are over-stepping the limits of what we might rightfully do as keepers of this world, including ourselves and our children?

It is one thing to encourage children to develop the abilities or traits which they have inherited. It is quite a different thing for parents to, as it were, implant certain abilities of their choice in their children. And there are many reasons why children might resent parental actions of this radical kind.

First, there is the problem of how to be sure that one trait is objectively better than another. In particular, the present generation's perception of improvement may not be the same as that of future generations. Moreover, children who have been genetically tampered with for the sake of their improvement, may well resent having been treated as manufactures. As the Pope said in his 1983 address on genetic engineering to the World Medical Association. "genetic manipulation becomes arbitrary and unjust when it reduces life to an object, when it forgets it is dealing with human subjects, capable of intelligence and freedom, worthy of respect whatever may be their limitations."

Of course, the advocates of enhancement gene treatment may argue that there is no sharp line between cure and enhancement — or that curing really is enhancing. And so, if curing is alright why enhancement, at least if it is restricted to the individual child and does not affect future generations. But this argument does not help their case. There is no clear line between talking or shouting either, yet there are definite cases of both. And most of us can see that there are such

things as real illnesses, and that curing the individual child of an illness such as cystic fibrosis is very different from making sure it has the body and strength of an Olympic athlete, the mathematical and scientific intelligence of an Einstein and the voice of a Pavarotti or Maria Callas.

Indeed, is it not true that there is something very distressing about people's ambitions to enhance the qualities of their children? Implicit in this way of thinking is a refusal to accept children as they are. And, surely, our acceptance of our children should not be conditional on whether they fulfil certain standards or specifications. Yet, conditional acceptance of children has already become an everyday fact, as witness the practice of prenatal diagnosis and selective abortion of substandard babies. If prenatal diagnosis and selective abortion is one side of the eugenic coin, enhancement techniques promoting certain types of child regarded as superior is the other. The latter may be regarded as a more benevolent approach, but it confers a new dimension on human relationship by turning children into goods made to specification. To seek a cure for a sick child is a very different thing. This is to take care of it and accept it as is, while doing everything to help it.

If we turn children into artifacts manufactured to our specification, we depersonalize them and by so doing we devalue our relationship with them. By viewing children as objects and seeing their value as a measure of the extent to which they meet our expectations, we degrade our children and impoverish ourselves.

According to the Biblical tradition, human value and dignity derives from the understanding that each one of us is created in the same image, the image of God. This view may no longer be generally accepted. However, each one of us recognizes his or her own worth as a person. To recognize another as a person is to recognize that same intrinsic human worth in him. But the techniques of prenatal selection and enhancement engineering are an offense to human dignity, because they mean treating children as commodities and objects of manipulation which must satisfy our requirements and pass our quality control. These techniques ignore the inherent dignity and worth of each one of us, whatever our limitations. They overstep the boundaries of what we might rightfully do as stewards, but not masters, of our own and our children's earthly natures.

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