

The person, the soul, and genetic engineering

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Argument about the ethical possibility of the therapeutic use of embryonic stem cells depends critically on the evaluation of the moral status of the very early embryo. Some assert that at the blastocyst stage it is only potentially human, not yet possessing the full ethical status of personhood, while others assert that from its formation the embryo possesses all the moral rights of a human person. It is shown that a decision on this issue is closely related to how human nature is to be understood. The idea of a person as a dual combination of body and spirit correlates naturally with the assertion of absolute personhood from conception, while an idea of human psychosomatic unity encourages a development picture in which the embryo only grows gradually into personhood. The latter view is seen to be encouraged by new advances in science which emphasise the importance of the concept of information in the discussion of complex systems. Other ethical issues related to human genetics are also briefly reviewed.

Many of our ethical perplexities arise not from uncertainty about basic moral principles, but from the difficulty of understanding how these principles are actually to be applied in specific circumstances. Such problems are especially likely to arise when scientific advances take us into realms of possibility of a wholly novel kind. The accumulated wisdom of the past is then no longer sufficient in itself to show us what we should do. Hard thinking will be required to discern the right way ahead.

In a situation of this kind, careful public discussion is essential, preferably taking place before the new technology is actually on the shelf, awaiting use. The participation of the relevant experts in the debate is indispensable, for only they can tell us what has become possible and what its further consequences might prove to be. Yet, they cannot be left to act as judges in their own cause. As the hymn reminds us, every calling has its snare, and the danger for the researcher is that of being carried away by the excitement of the research: “We’ve done this, we’ve done that; come on, let’s do the next thing.” Not everything that can be done, however, should be done. Hence the role of society in the discussion, collectively seeking the wisdom to choose the right and refuse the bad in making use of the technological power that stems from advances in scientific knowledge. Too much current ethical discourse takes the form of the clash of single issue pressure groups, one proclaiming “X is wonderful; let’s get on with it”; the other proclaiming “X is disastrous; don’t have anything to do with it”. Whatever X may be, it is very unlikely that either of these statements is true. X will be good for some purposes and bad for others. Hence the need for temperate and rational moral debate.

I want to illustrate some of these general points by a particular consideration of problems arising from recent rapid advances in genetics. I turn first to issues relating to the status of the very early embryo, concentrating on the

question of the ethics of artificial cloning. Involved is the technique of cell nuclear replacement (CNR), whose use led to the birth of that most famous of sheep, Dolly. The issue now, however, is the possible application of CNR to humans rather than to animals.

It is very widely agreed, with only a very few rogue exceptions, that reproductive human cloning—the strict analogue of the process that led to Dolly—is ethically unacceptable. There are gross safety problems to be expected in view of the very many failures and malformations found in the animal experiments. There are the long term health uncertainties suggested by the premature ageing apparently found in Dolly. It would be extremely irresponsible to take these risks in the case of human subjects. Even if these difficulties were eventually found to be surmountable, serious ethical doubts would remain, such as the issue of the moral propriety of creating a child who was the identical twin of one of its parents—a totally unprecedented and highly questionable form of family relationship. In the United Kingdom, any attempt at reproductive human cloning would be a criminal offence.

On the other hand, research into so called “therapeutic cloning” has recently been made legally permissible in the United Kingdom, on a licensed case by case basis. The aim of this work would be to use CNR to produce a very early embryo with the same genetic make up as a specific living person. The intended purpose would not be the illegal implantation of this embryo in a woman’s womb, but the development of the embryo in vitro to the blastocyst stage (five days) and the removal of stem cells from it, so that they could be cultured to yield tissue cells for use in the experimental treatment of serious medical conditions, such as Parkinsonism or Alzheimer’s. Because of their cloned genetic nature, these cells would be immunologically compatible with the intended recipient, and so expected to be free from problems of rejection. Licenses necessary for experiments of this kind can be issued by the Human Fertilisation and Embryology Authority, provided it is satisfied that the research is for serious medical purposes unlikely to be attainable by a non-embryonic route.

This is the legal situation in the United Kingdom today, but there has been a significant amount of argument about whether therapeutic cloning is, in fact, an ethically acceptable procedure. Law and morality do not necessarily coincide. The discussion centres not on the basic principles, but on how they are to be applied. It is an agreed general requirement of medical ethics that interventions on a human person are to be for the benefit of that person, and that any exception to this rule—for example, the surgical removal of a kidney to be donated to a compatible recipient—must be subject to safeguards that have to include the free and fully informed consent of the person involved. In Immanuel Kant’s famous formulation, human persons are always ends and never

Abbreviations: CNR, cell nuclear replacement; IVF, in vitro fertilisation; PGD, preimplantation genetic diagnosis; PND, prenatal diagnosis.

simply means to an end. The application of this principle is not, however, always straightforward. How should it be applied to those, such as young children, who are unable to give informed consent to novel medical procedures that seem to carry small risk to the patient but which might yield great potential gain for others in the future if the research proves fruitful? Coming straight to the point of our present concern, how should the principle be applied to the very early embryo?

If it is correct, as the official teaching of the Roman Catholic Church affirms to be the case, that an embryo is fully human from the moment of its formation, then it would be agreed to have the moral status that makes its destruction in order to harvest its stem cells (in the way that therapeutic cloning requires) totally ethically unacceptable: but is that judgment of embryonic moral standing correct?

The *Human Fertilisation and Embryology Act* of 1990 is based on the recommendations of the Warnock committee which concluded that, while the early embryo is certainly potentially human, it is not initially fully human, with the absolute ethical status that would confer. The very early embryo is entitled to a deep moral respect because of its potential humanity, so that it is not just a speck of protoplasm that you can do what you like with and then flush it down the sink, but it is not yet fully a human being. On this basis, the act permits the licensing of certain kinds of research uses of embryos before the age of 14 days. This particular time limit was chosen because it coincides with the first onset of structure within the embryo, with the formation of the primitive streak from which the central nervous system will subsequently develop. Before 14 days the embryo is an undifferentiated mass of pluripotent stem cells, capable of developing eventually into various kinds of tissue but not yet specialised in any way. The absolutely central ethical issue in relation to therapeutic cloning is whether the Warnock judgment is correct, or whether the truth lies with the official Roman Catholic position.

So, when does an embryo become a human being? The arguments about therapeutic cloning have arisen because different people answer this question in different ways, some affirming that it is indeed at conception, others that it is only at some later stage of development. Is it possible to find some rational grounds for decision that can advance the discussion beyond the simple assertion of an intuitive feeling? I think it is possible to make a little progress, but quite a long intellectual journey has to be undertaken to get us there.

I start in what may well seem a far country, by drawing attention to a very interesting development that I believe will prove to be of particular significance for science in the twenty first century. We are just beginning to be able to study the behaviour of complex systems in some degree of detail. As this work progresses, it will provide an important complement to science's traditional method of "divide and rule", based on the reductionist strategy of splitting entities up into their constituent parts. This latter technique has certainly proved highly effective for many purposes, not least because it is usually easier to think about bits and pieces than about the complex entities that they compose. We have learned a lot in this way, as someone like myself—a former elementary particle physicist concerned with studying how matter is made out of quarks and gluons—should be the first to acknowledge. There are also many important things that cannot, however, be learnt in this fashion. Nature is more subtle and more interesting than the reductionist story alone can tell. In a celebrated phrase, "More is different"; the character of complex systems exceeds the sum of their parts.

The infant science of complexity theory seeks to redress the balance between thinking in terms of constituents and thinking in terms of totalities. I call it a "science", but at present it is really only at the stage of natural history, at

which people study particular "for instances", discovering in these examples very surprising patterns of behaviour, but not yet having access to an underlying theory capable of explaining adequately what is actually going on. The truth is that complex systems are just too difficult for us to think about in general terms at present. The best we can manage to do is to investigate a series of computerised models. I want to give a flavour of what is going on by describing a model that was constructed by Stuart Kauffman.¹

In fact, it is a logical model, realised through an elaborate computer programme, but it will be easier to understand if I give an account of it in terms of a corresponding hardware realisation. Consider a very large array of light bulbs. Each bulb can be in one of two states: on or off. The system develops in steps according to a specific scheme. Each bulb in the array is correlated with two other bulbs somewhere else in the system. Whether they are on or off now will affect, in a specified way, the behaviour of the bulb with which they are correlated, at the next step in the development of the system. The precise details need not concern us (in technical logical terms, we are dealing with a Boolean net of connectivity two). What does concern us is the way in which the array is actually found to behave.

Things are started off in some random configuration, some bulbs on and some bulbs off. I would have expected that, as it develops, nothing very interesting would happen and the array would simply twinkle away haphazardly for as long as you let it do so. In fact, this expectation is quite wrong. It turns out that very soon the array settles down to a highly ordered behaviour, cycling through a very limited number of patterns of illumination. This represents the spontaneous generation of an astonishing degree of large scale order in the system. Suppose, for example, there are 10 000 bulbs in the array. The number of different patterns of illumination that in principle are possible is about 10^{3000} (that is, a one followed by three thousand zeroes, a very large number in anybody's book). In actual fact, however, it is found that the array cycles through about only a hundred patterns of illumination. I find that an absolutely staggering fact— 10^{3000} possibilities reduced to just 100.

So what is going on? I am afraid I have to say that at present we do not know. There must be a deep general theory behind all this, but its nature is currently unknown to us. What we do know is that there seems to be a general tendency for complex systems to display quite remarkable powers spontaneously to generate highly ordered patterns of behaviour. Such systems possess properties that we could never have begun to guess at simply by thinking about the interactions of their individual constituents. More really is different.

My hope and expectation for the science of the twenty first century is that an entirely new and fertile way of thinking about nature will develop, complementing the reductionist/constituent way in which we have thought over the last 350 years. The physics of past generations was based on a bits and pieces approach, thinking in terms of the exchange of energy between particles. That approach was certainly not wrong, but it has turned out not to be wholly adequate. We need also to be able to think holistically in terms of overall behaviour, as well as reductively in terms of parts. The key to the new thinking will surely lie in being able to deal with patterns of holistic behaviour, and the key to understanding such pattern generation will lie in a suitably enhanced and generalised concept of information, the means by which patterned behaviour can be specified and described in dynamical terms. I believe that by the end of the twenty first century, information will have taken its place alongside energy as an indispensable category for the understanding of nature.

Very interesting, you may say, but where is the embryo in all this? Well, we are getting there, but we still have a way to go. We can make some further progress by daring to ask a very fundamental question indeed: what is the nature of the human person? Much traditional thinking followed Plato and Descartes in giving a dualist answer: a human being is both body and spirit, understood in distinguishable and separable ways. If you do not like that reply, you can join Gilbert Ryle in sarcastically calling it the idea of “the ghost in the machine”. Yet that way of thinking does seem to have a fair degree of plausibility, in that it takes seriously what appear to be two contrasting aspects of our experience: being part of the physical world (we bump into things) and being thinking agents (we decide what to do). Nevertheless I think that the dualist mind plus matter approach is one that is very difficult for us to embrace today. The effects of drugs and of brain damage make it clear how intimate is the connection between physical body and mental experience. The evolutionary insight that links us with our animal ancestors and, through them, with the chemically rich waters of early Earth from which life is thought to have arisen, appears to confirm humans as an integral part of the physical world. In other words, I believe that we human beings are psychosomatic unities, a package deal with mind and matter in inseparably complementary relationship to each other. It is a conclusion that would not have surprised the writers of the Bible. It has often been acknowledged that they thought of human beings as “animated bodies”, rather than “incarnated souls”. We are risen beasts and not fallen angels trapped in the flesh. If Christianity has often seemed to have bought into a dualist account of human nature, that has been because of platonic influence on its development, rather than being drawn from its scriptural roots.

If human beings are psychosomatic unities, what then has happened to the soul? Has it been lost altogether? I do not think so. The soul stands for what one might call “the real me”. What that is is almost as problematic within life as it might seem to be beyond death. What could it be that links me, the bald and ageing academic of today, with the young lad with the shock of black hair in the school photograph of sixty years ago? It is tempting to reply, physical continuity, but that is actually an illusion. The atoms in our bodies are changing all the time, through wear and tear, eating, and drinking. We have very few atoms in us today that were there even a few years ago, let alone sixty. We live in a state of material flux. Atomically, I am completely different from that schoolboy.

Philosophers sometimes like to discuss the problem posed by a ship on a long voyage at sea. In the course of the journey, many piecemeal repairs prove necessary, to such an extent that when it reaches its destination there is not a plank or a mast that was actually part of the vessel when it set sail. Is it then the same ship that arrives in port, or is it a different one? I would say that it is the same ship if the pattern of its construction has been preserved. But if that pattern has been radically changed—if it left port as a single hull and arrives as a catamaran—then it is not the same ship. It is the pattern and not the planks that matter for identity.

Things are somewhat similar, I believe, with us. The “real me”, connecting with that young schoolboy, is not the matter of my body, but it is the almost infinitely complex *information bearing pattern* in which that matter is organised. That pattern is my soul,² the carrier of continuity bridging the sixty year gap. A number of comments need to be made on this proposal:

- (1) This view of the soul is certainly consonant with the new scientific developments concerned with the role of information that I have tried to sketch earlier, though

the soul obviously involves concepts of very much greater complexity than anything scientists are currently discussing, going well beyond anything that today we are capable of being able to treat with adequacy or precision. The complexity of even a single living cell greatly exceeds that of any system that has been studied through computer modelling. It is not within our present power to frame the detail of a realistic anthropology, but this should not deter us from a degree of boldness in metaphysical conjecture. As Augustine said about the Trinity, it is better to say something, however modest in scope, than to be totally silent. Frankly, some measure of speculative thinking is necessary, and an information bearing pattern seems the best notion to pursue.

- (2) The pattern that is the soul will have a dynamic and developing character. The “real me” grows as my character forms and as I acquire new insights and memories. We may suppose, however, that there is also an unchanging component in the information carried by the soul, constituting the personal signature that guarantees continuity of identity. One aspect of that unchanging dimension of the soul will be my individual genome, but only the most determined (and mistaken) genetic determinist could suppose it to be the whole of what is involved in that personal signature.
- (3) The pattern that is me is not wholly contained within my skin. As a person, I am constituted in an important way by the relationships that sustain my life. In some way, hard to imagine in any detail, they also must be a part of the soul. The Christian expression of this insight is conveyed theologically in the Pauline concept of the believer as a member of the corporate body of Christ.³
- (4) The soul as understood in this fashion possesses of itself no intrinsic immortality. The pattern that is me will be dissolved at death with the decay of my body. In this sense, there is no natural expectation of a destiny beyond death. Yet for the Christian believer, trusting in the everlasting faithfulness of God, it is an entirely coherent hope that my Creator will remember the pattern that is me, holding it in the divine memory until the restoration of my embodied identity through God’s great final eschatological act of resurrection. True Christian hope is not that of a spiritualist survival, but it centres on a real death followed by the greater reality of the life of God’s new creation. Christ’s resurrection within history is the foretaste and guarantee of this destiny awaiting the rest of us beyond history (Polkinghorne,² chapters 9 and 10).
- (5) The notion of the soul as the information bearing pattern carried by the body is, in many ways, an antique notion revived in modern dress. The great medieval theologian, Thomas Aquinas, followed Aristotle in believing that the soul is the “form”, (pattern) of the body. The modern reformulation of this concept differs, however, from its predecessor in taking a more dynamical and relational view, as well as in appealing to contemporary scientific developments in the manner described.

We are ready, at last, to return to the ethical status of the early embryo. A dualist view treats the soul as a spiritual entity additional to the physical body. In the Christian context, one will see the soul as a once for all spiritual endowment given by God, and it is quite natural to identify the moment of its bestowal with the moment of conception. In that case, the embryo will be fully human from the start and its destruction to provide a source of stem cells would be as morally unthinkable as would be the removal of a living person’s heart to provide the material for transplantation into another. Thus a dualist view of human nature accords

naturally with taking a rigorist view against the ethical acceptability of therapeutic cloning.

A psychosomatic view of human nature, such as I have been suggesting, leads to a developmental view of the soul as something that forms and grows. Full humanity is not attained when the embryo is formed, but it requires the unfolding of a process over time. On this view, the moral status of the embryo is something that it grows into. It is interesting to note in this regard that Aquinas (again following Aristotle) held that ensoulment took place between 40 and 80 days. The very early embryo has no information bearing pattern beyond that carried by the DNA in each of its cells. The Warnock time limit of 14 days as the period within which the instrumental use of the embryo for serious purposes would be ethically permissible, seems appropriately cautious and conservatively calculated. It is in the light of this understanding that I personally have felt able, when serving on various government advisory committees, to endorse the stance now expressed in United Kingdom legislation.

Before I leave the matter of therapeutic cloning, there are two further points I wish to make. One is simply to underline the way in which what seemed at the start to be a very focused and specific question (Is therapeutic cloning ethically permissible?) has turned out ineluctably to involve very fundamental issues (What is human nature? What is the soul?). We see again how essential it is that moral debate is not confined narrowly to the experts, but that it is to be conducted in the widest possible forum, calling upon all the resources for understanding that are available to us. One must expect that the world's faith traditions have an indispensable role to play as contributors to that comprehensive discourse.

The second point is more specific, pointing to what seems to me to be a disturbing possibility of ethical confusion present today in society's thinking. The Warnock limit on embryonic research is 14 days. The legal limit on therapeutic abortion is 24 weeks, and even up to term in the case of the risk of "grave handicap". I recognise that embryo research and abortion cannot simply be equated, for the latter involves the ethical interests of a highly relevant third party, the woman carrying the fetus. Yet the difference between these two time limits is very great. The discrepancy suggests to me that we have some more work to do in the search for a consistent understanding of moral truth and its application to medical ethics.

I can be briefer in moving on from cloning to other ethical issues related to human genetics. This is not because these matters are less important, for they are certainly significant, but because the thinking that is necessary has a closer connection with general medical ethical considerations. There are two broad areas of concern.

First: *testing and selection*. We inherit half of our genetic make up from each of our parents. Tests have been developed that can identify the presence of mutated genes in that make up which will have implications for the development of serious disease. The predictive consequences entail a variety of levels of certainty.

A dominant single gene mutation, such as that responsible for Huntington's disease (a late onset condition that typically leads to severe mental degeneration and death in the early forties), gives an essentially certain diagnosis of future disease and implies a one in two chance that offspring will also face the same fate. A recessive mutation, such as that responsible for cystic fibrosis, has to be inherited from both parents for the disease to manifest itself. Those who have only inherited the mutation from one parent are "carriers", who are perfectly healthy in themselves but who have a one in four chance of offspring with the disease if they mate with another carrier.

Some diseases, such as breast cancer and colon cancer, generally have a complex aetiology, but there is a subset of cases in which a particular genetic mutation strongly disposes those carrying it to the development of the disease. Other diseases may have only somewhat enhanced susceptibilities due to genetic mutations, while for many others the genetic component, if present at all, is probably associated with complex patterns of interaction between many genes.

Tests have been, and are being, developed for monogenetic diseases and susceptibilities. The development of so called DNA chips will enable the rapid use of batteries of tests of this kind. Among the ethical issues that arise are:

- (1) In addition to the normal considerations of medical confidentiality, genetic testing raises special issues because of possible implications for those who share in part the same genetic inheritance. If someone has been diagnosed with a severe genetic disorder carrying implications for genetic kin, but declines to allow the information to be passed on to them, can a genetic counsellor properly break individual confidentiality and inform siblings of the possible risk? Some difficult decisions may have to be made in individual cases, particularly if the condition is treatable so that there are substantial benefits possible for those made aware of their condition.
- (2) Genetic tests are frequently offered to people at risk who currently are healthy but for whom a positive result would carry the implication of future illness. There is surely a "right not to know" that they may wish to exercise after appropriate counselling prior to a decision about whether to be tested. Before a test for Huntington's became available, those known to be at risk were asked if they would want to be tested if this became possible. About 80% said that they would, but when a test was actually developed, the take up was less than 20%.
- (3) Prenatal diagnosis (PND) is the testing of a fetus in the womb to see if it has a serious genetic disorder. If the test is positive, it is likely that the parents will be offered the choice of terminating the pregnancy. If this option is taken in the case of a late onset disease, such as Huntington's, does this not seem to imply that forty years of life are not worth having?
- (4) Preimplantation genetic diagnosis (PGD) involves testing an embryo formed in vitro, for a serious genetic disorder. If the test is positive, that embryo will not be implanted, though others formed at the same time and free from the mutation may be. Many see this selection as a less drastic decision than the abortion of a fetus developing in the womb, though this obviously depends upon one's assessment of the status of the very early embryo. In law, there is no obligation on a woman to accept implantation of any embryo, and in many in vitro fertilisation (IVF) treatments there will be embryos "left over" that will not be implanted in order to avoid multiple pregnancies. If that is the case, why not choose "the best"? Yet there is a danger that the use of that very phrase begins to imply an unacceptable degree of commodification of children. This point leads us on to a consideration of the second broad area of ethical concern in modern medical genetic practice.

Second: *genetic manipulation and transfer*. Modern techniques make it possible to engineer the genome in a variety of ways. Should such techniques be used in the human case? One may distinguish two different possibilities:

- (1) Somatic use. In this case, the appropriate cells in the body of a specific patient would be manipulated in order

to remedy a defect that had resulted in a particular disease, such as cystic fibrosis. This intervention would only affect the specific individual treated. No new issue of principle seems to be raised here beyond those that apply to medical therapeutics generally.

- (2) Germline use. Here the technique would be applied either to gametes (egg or sperm) or to an early embryo. In contrast to somatic use, this kind of manipulation would have effects that could propagate to future generations. Because of grave uncertainties about what these long term effects could prove to be, and because of their irreversible character, there is currently a generally respected moratorium on human germline manipulation. Once again, however, one must ask the question: what would the ethical situation be if these uncertainties as to safety were to be resolved satisfactorily? If we could eliminate the propagation of Huntington's by genetic engineering, should we not do so? That would be seen as remedying a defect by restoration to the norm.

What, however, about attempts at enhancement beyond the norm? Discussion of designer babies with desirable characteristics (athletes or intellectuals), or self improvement of the human race, is science fiction talk today, but what if it became a feasibility, as forms of gender selection already are? Surely there are moral limits that must be placed on parental choice if its exercise is not to be in danger of commodifying children. In the prospect of genetically engineering progeny, one faces that danger in an extreme form. The human genome, in a sense the carrier of life, is an entity of such value that its manipulation is a matter of extreme ethical sensitivity. If I am right in suggesting that the genome is a small component in the constitution of the soul, it must surely be treated with sacred respect. We need to consider carefully whether it would not be a step too far for human beings to take it upon themselves to interfere with it. Here is

a case where the hackneyed phrase "playing God" may really be relevant as a moral warning.

I do not find it easy to decide where and how to draw the moral line on this issue. It certainly cannot be done by a simple endorsement of the "natural" and a questioning of the "unnatural". Much of routine medical practice is unnatural in a plain sense. Recall the reservations initially expressed about heart transplants, now readily accepted as a therapeutic resource, though as radically unnatural as any genetic transfer. In any case, human beings are themselves a part of created nature. It is not inappropriate to end this paper with a moral question mark. I conclude where I began, with an emphasis on the need for the widest and most measured public moral discussion of the perplexing issues raised by contemporary discoveries in genetics. It is a debate of great importance to which we all need to seek to contribute and I very much hope to see the faith traditions making further distinctive contributions to this process.

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experimentation on embryos are deemed permissible would not be congenial to Roman Catholic officialdom, for whom the destruction of one life cannot be condoned even if it were to make possible the creation of another.

Dialogue traversing a secular/sacred divide can be thwarted for other reasons. Those sympathetic to religious voices may concede that claims for privileged discernment are unhelpful but still insist that secular ethicists too readily fail to appreciate that religious beliefs can be constructive in strengthening motivation and in deepening commitment on ethical issues. Theologians who have served on ethics committees have sometimes expressed a sense of frustration accompanying their attempts to explain that they are starting from a different point, and working from different presuppositions, than those who settle for exclusively utilitarian and consequentialist principles.¹ The

¹Lecture by Revd Dr John C Polkinghorne, winner of the 2002 Templeton Religion Prize given on given on Wednesday, 12 February 2003 at St Paul's Cathedral, London, UK

Commentary on: The person, the soul and genetic engineering*

J H Brooke

The far reaching effects of the genetic revolution on our lives as a whole make it difficult to separate the secular and sacred issues involved

In accepting this opportunity to comment on Dr Polkinghorne's Templeton Prize lecture, I recognise that there is a significant division between those who would see religious beliefs as irrelevant in the ethical debates concerning new biotechnologies and those who, with Dr Polkinghorne, are willing to look to the major faith traditions for insight into the nature of human identity and selfhood. In secular discourse, the intrusion of religious language has long been resisted on many grounds: that sound ethical principles do not

need transcendent ratification; that those who presume a privileged moral discernment derived from their religion frequently fail to appreciate the complexity of genetic and medical science; and that internecine disputes within faith communities and historically rooted incommensurabilities between them seriously compromise any prospect of consensus. This problem is tacitly acknowledged by Dr Polkinghorne himself when he notes that his willingness to accept the 14 day threshold before which certain forms of

problem is not simply that different values may be held by religious believers serving on such committees: incompatible worldviews may also collide. It is difficult to see how the pleas for procreative autonomy that have sometimes been invoked in support of reproductive cloning² could be wedded to conservative Christian ideals in which a child is seen primarily as a gift of God and not a commodity to be designed to order.

Sir John Polkinghorne's reflections on the promise and the problems of genetic engineering are particularly welcome, not only because of the respect he invariably accords serious scientific research but also because they reveal the thinking of an influential theologian with years of experience on the British Medical Association Medical Ethics Committee and latterly on the Human Genetics Commission. In previous writings he has made no secret of his conviction that "theology's concern with creation and with individual human identity and value means that it should be in a position to make a significant contribution to the debate".³ Noting that in the Abrahamic faiths special status is bestowed on each human creature by virtue of their being a "personal object of divine love and compassion", he has affirmed the ethical corollary that "no human being is available for instrumental use of any kind".⁴ This would appear to proscribe more than the Kantian principle that an individual should never be used *exclusively* as a means. In the Templeton Prize lecture the note of caution is sounded several times: "not everything that can be done, should be done". And towards the end he is willing to invest the hackneyed phrase "playing God" with meaning as an apposite warning in some cases. Given the context in which he spoke, it would be reasonable to assume that many in his audience would have sympathised with that cautionary tone. I shall return to it later because objections based on the usurping of a Creator's role can be both diverse and problematic.

In Dr Polkinghorne's address there is the quest for a judicious balance between the implementation of new technologies and the advocacy of restraint. In this respect he stands in a long tradition of Christian commentators whose stance towards new technologies has not been oppositional. For centuries there have been resources within theology itself to sanction programmes for the enhancement of nature and of human life.⁵ The iconoclastic medical reformer of the Renaissance, Paracelsus, saw in the application of chemical knowledge a *redemption* of

nature; Francis Bacon spoke of a *restoration* to a pristine condition of nature before the Fall; concepts of improvement were easily subsumed under doctrines of Providence, as when Joseph Priestley, in the late eighteenth century, set new science in opposition to superstition but not to a rational religion.⁶ Legacies from past theologies still appear in contemporary debate and in ways that create the space for innovative therapeutic techniques. In one of his early essays on theology and the genetic revolution, Ronald Cole-Turner referred to genetic engineering as "redemptive technology", adding that "we may regard it as redemptive intervention if a couple is screened, found at serious risk, and advised not to conceive a child".⁷

Concepts of human dignity that frequently feature in theological discourse are sometimes envisaged as intrinsically obstructive to programmes for genetically modified humans. It was observed by Roger Brownsword, Specialist Adviser to the House of Lords Select Committee on Stem Cell Research, that the Committee did not find appeals to human dignity particularly helpful.⁸ Yet there are sophisticated theological discussions in which dignity is understood relationally rather than being predicated of an embryo at its origin. A Lutheran theologian, Ted Peters, has written that "dignity is a relational concept that begins first with the external conferral of dignity before it is claimed by a person as something intrinsic".⁹ Drawing on a Christian eschatology, he insists that "rather than something imparted with our genetic code ... dignity is the future end product of God's saving activity that we anticipate socially when we confer dignity on those who do not yet claim it".¹⁰ In theologies of this kind, the dignity honoured can be that of future beneficiaries of medical research.

Openness to innovative techniques has been a special feature of theologies in which *Homo sapiens*, ostensibly made in the image of God, is seen as a co-creator with (or more modestly collaborator with) a beneficent deity. Such constructs are not new. It was a facet of Isaac Newton's theology that "that power which can bring forth creatures not only directly but through the mediation of other creatures is exceedingly, not to say infinitely greater".¹¹

In their different ways each of these theologies would problematise distinctions between the natural and the artificial, removing objections, as Dr Polkinghorne also does in his concluding paragraph, to interventionist techniques based on their alleged deviation from the "natural". The justification of

medical intervention in other contexts has long been paradigmatic for the legitimisation of what in ultraconservative religious circles might once have been understood as interfering with providence. This is not to deny that revulsion against certain transgenic practices is often expressed with religious fervour. It is, however, worth noting that public anxiety may derive as much from an outdated essentialist concept of species as from explicitly religious scruples. There is an irony here because those who object most strenuously to any form of genetic modification, whether of food or of those who eat it, commonly and unwittingly presuppose the very genetic reductionism from which a more holistic, religious understanding of the human person might be thought to offer protection.

In the conceptualisation and transmission of that understanding, the word "soul" has been of particular significance. One of the most creative and stimulating features of Polkinghorne's text is his attempt to reformulate the concept of soul in a way that is coherent with the monistic presuppositions of the neurosciences. The indestructible soul of Cartesian dualism has no place in his philosophy, reminding us that Protestant theologies in particular have tended to construe the prospect of an afterlife in terms of the resurrection of the body rather than the automatic survival of an immaterial substance. Although there are eminent philosophers of religion still prepared to defend a dualistic interactionism in which mental states are states of a distinct mental substance,¹² Polkinghorne's redescription of the soul in terms of information bearing patterns sits more comfortably with the dual-aspect monism currently finding favour with religious thinkers.¹³

For a historian of science the assertion that the "pattern is my soul"—that which stands for "the real me"—is engaging because something similar was tried by David Hartley and his admiring successor Joseph Priestley in the eighteenth century. This was of course in the absence of modern information theory but the basic concept was similar. In the development of a person patterns of vibration were established in the material substrate of the mind. Their being somehow "fixed" and persistent was evidenced by the facility with which ideas were associated and recurred in association. A "real me" was constituted by a distinctive pattern or series of patterns that could in principle be reconstituted in a resurrected body. This was pretty daring stuff, especially in Priestley's Unitarian theology. And its critics posed the question whether the

recurrence merely of a pattern was sufficient guarantee of the continuity of personal identity. A fellow dissenter, Richard Price, took exception to Priestley's account of the hereafter¹⁴:

It is ... implied, that the men who are to be raised from death, will be the same with the men who have existed in this world, only as a river is called the same, because the water, though different, has followed other water in the same channel ... Did I believe this to be all the identity of man hereafter, I could not consider myself as having any concern in a future state.

There is clearly a question whether a comparable objection might not be levelled against the equation of individual identity with an information bearing pattern. I shall not, however, pursue that question here because, at this juncture in his argument, Polkinghorne is careful to say that he is speaking from within a Christian tradition in which one's *hope* is grounded in higher level axioms of divine fidelity and remembrance.

A question that might be pursued concerns those points in the lecture where cautionary principles were enunciated but where the limitations of a lecture format precluded further articulation. There are references to an "unacceptable degree of commodification", to "moral limits" that must be considered in the context of genetic enhancement beyond a norm, and to the applicability of the "playing God" objection as a warning against unstudied interference with the human genome.

Concerns about an *unacceptable* degree of commodification are voiced in the context of preimplantation diagnosis and in the selection of what may be deemed "the best" embryo for selection purposes. It is perhaps pertinent to ask at what step the *degree* of commodification becomes unacceptable. Does the threshold lie with any attempt at genetic enhancement, where questions can be asked about the wisdom of an artificial selection in which offspring may have to live with the knowledge that their particular strengths, rather than others, had been deliberately selected for them? Would the much publicised case of "saviour siblings" constitute an example of *acceptable* commodification, given that in this case "the best" can be specified as the best match for the role of donor. The issues here are complex because if the additional child were to be perceived by the parents as only a means to an end, then references to inappropriateness might be salient. However, one

could envisage that the saving child would be loved all the more for having made a priceless contribution to the life of the family. It is even conceivable that parents with religious convictions would see in the technological intervention a kind of "miracle" that would not preclude seeing the later child as a divine gift. From the child's point of view, it is surely undeniable that there could be deeply conflicting feelings. It might be difficult to prevent the feeling that that they would not have come into being had they not been wanted for the saviour role—especially if they were to suspect that their parents would not otherwise have had another child. Another concern might be the guilt feelings that could come from the knowledge that in the selection process, other embryos had been discarded. There could be the loss of that uninhibited gratitude for life, springing from the sheer improbability of one's existence, on which both religious and secular writers have movingly written.¹⁵ On the other hand, the child might grow up to be grateful for the fact that his or her life had been given an additional meaning by virtue of its saving role—and even a possible religious meaning in conforming to a model of redemption through sacrifice. One thing is certain. It is impossible to generalise about consequences. What in one family might be a binding process, in another could be explosive. In the real world of sibling rivalry and jealousy, it is discomfiting to contemplate a scene in which one child could say to another, "But for the grace of *me* you would be dead". Speculations about psychological damage cannot be excluded from the debate and it should not be surprising that religious commentators take them seriously. Indeed, Polkinghorne has elsewhere declared the production of "saviour siblings" unacceptable: "it would be very psychologically damaging for a child even to suspect that he or she owed their existence primarily to the duty to help a sibling, rather than for the sake of the value and worth of their own being".¹⁶

When in the Templeton lecture he speaks of "moral limits" in the context of genetic enhancement beyond a norm, it is pertinent again to ask where the limits may lie. There are many issues here. One would be definitional problems concerning the "norm". It has been observed that much of the rhetoric in favour of genetic enhancements is couched in such therapeutic terms that it celebrates the supranormal without first considering what it means to lead a "normal" fulfilled human life. The faith traditions do have something to say about this, usually stressing the virtues of a communal rather than an isolated

life. An arresting concern, expressed in a discussion of cloning by the theologian Stanley Hauerwas, underlines the existential questions: "In the name of eradicating suffering, we use technological power to avoid being with one another in illness and death. Cloning thus becomes simply another means to escape the knowledge that, when all is said and done, we will each have to die alone".¹⁷ A second issue, which I shall not address here, concerns the relation between future programmes of genetic enhancement and earlier eugenic policies. Given the historical evidence, it should not be surprising that anxieties abound. The question is not simply "How do we choose the traits for enhancement?" but "How do we choose the choosers?". A third issue, which Polkinghorne's account brings into focus, concerns modifications of the human genome that he appears to think might jeopardise the "soul", in his special understanding of the word: "If I am right in suggesting that the genome is a small component in the constitution of the soul, it must surely be treated with sacred respect". Much may depend here on whether the soul is identified with an individual information bearing pattern, as Polkinghorne wishes to suggest, or whether one should speak of a soul as emerging from and having been made possible by the patterning to which he refers. As long as there could still be a "real me" in a genetically enhanced human, the problem might not be so acute. The deeper question must be whether such essentialist accounts of the human person can survive the challenge from those who affirm a heterogeneous and discontinuous self. Even here, however, there can be surprises. When Daniel Dennett published his *Consciousness Explained*, he presented his theory as one that was more propitious than its competitors for those who hankered after immortality: "If what you are is that organization of information that has structured your body's control system ... then you could in principle survive the death of your body as intact as a program can survive the destruction of the computer in which it was created and first run".¹⁸

It is with reference to interference with the genome that Polkinghorne implies that the "playing God" objection may not be vacuous. In one respect the phrase will always be inappropriate because the most the biotechnologist *can* do is to manipulate existing materials to achieve something new: to play the Platonist demiurge is the most that could be aspired to even assuming such aspiration exists. There is no creation *ex nihilo*. The importance of clarifying what might be meant by the "playing God"

objection has been urged in a recent analysis by Tony Coady.¹⁹ To use such language may connote nothing more than the hubris involved in the anthropocentric thinking that makes human beings believe they are entirely the beneficiaries of creation. It may mean nothing more than that specified human purposes may result in bad consequences. If a theology of humans as co-Creators lies behind its use, the protest may be against claiming equality with a Creator. A more common meaning would be the usurping of roles reserved for a deity, though one might ask whether there is any evidence that genetic enhancement has been on the deity's agenda. Coady's analysis is helpful because it includes the observation that the non-religious can still make sense of the objection, where it denotes an adventure beyond what is *known* to be safe, a need for humility rather an attitude of overconfidence, and a willingness to admit that the prospect of bringing changes to human nature can be a legitimate source of apprehension. Nor does it escape his notice that those most likely to invoke the "playing God" critique are those who may be accused of doing the same if they presume to have inside knowledge of the mind of God.

My conclusion is a plea for toleration and a better understanding of public anxieties, whether or not they are couched in religious language. In an important essay Bryan Wynne has exposed the manner in which representations of "the public" are constructed and manipulated by bodies impatient, in that famous Baconian phrase, to "effect all things possible". Wynne's essay is a contribution to a book that had its origin in empirical studies which showed that public reactions to genetic engineering are often voiced in ways that reflect a legacy from theology, however secularised it may have become.²⁰ Having examined the reports of leading expert bodies on the ethical issues that are taken to underlie public concerns about genetically modified organisms (GMOs), Wynne identifies four framing assumptions that have been "utterly unexamined and thus uncritically reproduced".²¹ The first is

that it is only public concerns, and not institutional presumptions in favour of biotechnology, that are unthinkingly held and therefore in need of critical scrutiny. The second is that the public is only concerned about specific consequences of biotechnology and not also about the "wider consequences of the endemic institutional denial of uncertainty". The third is that "cognitive content and emotional affect are not only categorically separable but also in some sense mutually inimical". This enables legitimate public concerns to be dismissed as emotive reactions. The reality, according to Wynne, is that in many public responses there is an awareness that the issues are not just scientific but are about the quality of social relations—about "accountability, control, direction, the representation of science as a creator of innovations, and a culture of public policy: in short about the undemocratic control of public meanings". A fourth assumption underlying expert reports on crop biotechnology is that non-utilitarian ethical objections can be understood (and marginalised) as individual private preferences. Conveniently, questions about the tendency of dominant institutions to exaggerate the adequacy of existing knowledge and questions about societal responsibility for the unpredictable consequences of implementation are often obliterated. If Wynne's diagnosis is correct, there is a need for mediating minds in the public arena, and all the more so because, as a recent feature in *Nature* has reminded us, decisions taken at the highest level on such matters as transgenic agriculture are ultimately dependent on political contingencies as much as on scientific or philosophical rationalities.²²

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