

Biotheology: Theology, Ethics and the New Biotechnologies

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Abstract

This paper brings bioethics into line with biotechnology (which means extending the traditionally narrow definition of bioethics) and proposes a new field of biotheology as a theology of life which belongs alongside the more traditional sub-disciplines of systematic theology such as theological anthropology (doctrine of humanity), Christology, pneumatology and ecclesiology. An intentional focus on biotheology will enhance the understanding of the human person as a part of the full spectrum of life created by God and it will provide greater form and depth to reflections on the diverse and difficult issues which biotechnology generates and with which bioethics needs to deal. The author proposes six biotheological principles which are designed to give ethical cohesion and theological structure to this new field.

Key Words

Biotheology, biotechnology, bioethics, creation, Trinity, imago dei, Christology, theological anthropology, ecology, DNA, gene technology, molecular biology, species, precautionary principle.

Biotechnology

The ethical issues dealt with under the heading 'bioethics' should logically parallel the scientific and technological issues which are covered in 'biotechnology'. However, the breadth and diversity of the territory covered by biotechnology (including gene manipulation, nanotechnology, biodiversity, ecology, biopharming (the use of genetically modified crops to produce pharmaceuticals, vaccines, hormones etc), reproductive medicine, stem cell research etc) is rarely matched in the field of bioethics where discussions are usually restricted to a much narrower area relating specifically to the treatment of the human person. This means that bioethics rarely situates the human person in the broader context which biotechnology presupposes and there is a tendency to overlook the significance of the connectedness of human, animal and plant life. Bioethics as it is usually understood is better referred to as biomedical ethics.

This paper aims to contribute by bringing bioethics into line with biotechnology – which will mean re-framing the ethical context; it also aims

to encourage the development of the complementary field of biotheology as a theology of life which belongs alongside the more traditional sub-disciplines of systematic theology such as theological anthropology (doctrine of humanity), Christology, pneumatology, ecclesiology etc. An intentional focus on *biotheology* will enhance the understanding of the human person as a part of the full spectrum of life created by God and it will provide greater form and depth to reflections on the diverse and difficult issues which *biotechnology* generates and with which *bioethics* needs to deal. After further outlining the situation with regard to biotechnology and bioethics I will propose six biotheological principles which are designed to give ethical cohesion and theological structure to this new field.

Some assume that biotechnology began in 1972 when the first recombinant DNA technology experiment was performed. However, although the most recent developments in molecular biology and genetic engineering are critically important, biotechnology has been a part of human history for thousands of years, at least since the ancient Sumerians and Babylonians used yeast to make beer, the Egyptians leavened their bread and the ancient Chinese used fermentation processes to preserve milk and produce cheese and wine. It has continued on through a wide variety of attempts to manipulate breeding processes, preserve foods, achieve artificial reproduction and generally control the processes of life and death and manipulate the forms in which life exists.

As a consequence of this, a sampling of biotechnological issues now includes various medical interventions and their effects on human life and death; reproductive technologies for humans and animals; gene analysis, modification and therapy for plants, animals and human; nanotechnology and issues relating to the human-machine interface; stem cell research and therapy; some biological mining and manufacturing techniques such as the leaching of ores and mine site rehabilitation; food and flavouring technologies; various agricultural techniques and crop modifications including improved food storage and nutritional quality, better pest resistance and increased water, temperature and salinity tolerance and biopharming; forestry issues involving faster tree growth, improved fibre, disease resistance and so forth; as well as aquaculture and various forms of animal research. The common points which run throughout are, firstly, the attempt to use biological processes to technological advantage in order to improve the quality of life and, secondly, the perceived connectivity between all forms of life.

This extraordinary array of issues comes about because of the way late twentieth century biotechnology brought together research done in a wide range of areas. This produced a synergy which set the scene for a biological revolution in the twenty-first century which will equal or surpass in significance the computing and information technology revolution of the last century.

One of the main reasons for this development relates to the way biotechnology has begun to unite a field which previously was divided in at least two ways. It was divided 'vertically' according to the *levels* of research which took place and 'horizontally' according to the *areas* which were being

investigated. There are at least six levels of research which have come together; these are the sciences which operate at the level of: (1) *molecules* (e.g. molecular biology, especially research on DNA and recombinant technology); (2) *cells* (e.g. cell biology including work on stem cells, aging processes and reproductive technology); (3) *organs* (e.g. transplantation and xenotransplantation and the manufacture of replacement tissues); (4) *species* (e.g. the nature and dynamics of the way species function and interact and the influence of genetically modified organisms on them); (5) *humans* (e.g. abortion, euthanasia, the use of medical technologies); and (6) *systems* (e.g. ecology and the influence of biological technologies). The work taking place at these different levels has become much more integrated than previously, and this dynamic inter-relationship has implications for the way previously different areas of research have come together.

While much common thought persists with a strong differentiation between areas of research on say, bacteria, humans, animals and plants, those actually working in these areas now tend to view the situation much more fluidly. At the heart of this has been the ever increasing focus on the role of DNA in life processes. From a scientific point of view the distinction between, for example, 'human genes' and 'animal genes' is arbitrary. There may well be 'genes which humans have' but at the most fundamental level the genes are not perceived as intrinsically human or animal, DNA is simply DNA wherever it is found.

The obvious reality is that gene transfer is now possible in such a way that old distinctions are being called into question. Previously impenetrable barriers are now being crossed and the old taxonomies of species and the distinctions which have previously divided medical technology, animal and crop research and the study of ecological systems are being called into question. Trans-kingdom gene transfer, biopharmaceuticals, nanotechnology and other such areas of research increase the trend towards a level of integration not generally matched in the ethical or theological fields.

Bioethics

The term 'bioethics' was coined in 1971 by cancer researcher Van Rensselaer Potter in *Bioethics: Bridge to the Future* (Potter 1971). Potter had a broad view and used the term to relate to all issues related to life. He did not equate bioethics with human biomedical research. He argued that advances in biotechnology had implications for all life systems and societies and he expounded on this in his subsequent book, *Global Bioethics* which integrated a scientific view of the world with religious and philosophical systems.

However, Potter's breadth of vision for a form of bioethics which matched the breadth of biotechnology was soon supplanted by a much narrower view dominated by medical researchers and ethicists. In 1976 Thomas Shannon published his influential book *Bioethics* (Shannon 1976) in which he dealt with abortion, handicaps, euthanasia, the right to die and the treatment of

the terminally ill, research on humans and informed consent. In the second edition in 1981 he added material on genetics and reproduction. He noted that the study was complicated by the interdisciplinary nature of the problems and by the continuing advances of science, but defined bioethics as 'a set of ethical teachings related specifically to medicine'.

The new field of bioethics continued on in the work of writers such as Gerald Kelly, John Ford, Richard McCormick, Charles Curran, Daniel Maguire, and Daniel Callahan. In 1986 H. Tristram Englehardt Jr., produced *The Foundations of Bioethics* (Englehardt 1986). In this standard text, bioethics was essentially about health care for humans including issues such as the beginning and ending of human life. This was, essentially, 'Bioethics Mark I'.

There have been times when bioethics has come closer to taking on a broader perspective. In 1988 David Suzuki and Peter Knudson wrote *Genethics: the ethics of engineering life*. (Suzuki 1989) This popularised the new term 'genethic' and was influential in helping people think more broadly, but it remained outside the field of 'bioethics'. In 1991, for example, Francisco Javier Elizari Basterra's *Bioethics* continued to treat 'bioethics' as medical ethics and little more (Basterra 1991). In 1996 Gilbert Meilaender's *Bioethics* (Meilaender 1996) still dealt primarily with issues concerning the beginning and ending of human life (abortion and euthanasia), although some genetics issues did make an appearance, though solely in terms of how it affected humans.

In *Cutting edge Bioethics: a Christian exploration of technologies and trends* (Hook, 2002) there was almost a return to Van Rensselaer Potter's original conception of bioethics. However, it can hardly be said that since then bioethics as a whole reflects the area covered by biotechnology or deals with the issues in the more integrated manner it deserves. It is still dominated by the medical model. 'Bioethics Mark II' needs to be developed to draw its principles from a wider ethical and theological background.

What can be learned from the usual medical approach to bioethics is the effectiveness of having a simple, yet comprehensive set of principles which establish the essential ground to be covered in any discussion of a specific issue. Bioethics Mark I has established a set of four or five principles which provide a basis on which to consider specific issues. These principles, in one form or another, are well known among the medical community¹ and may be summarised briefly as:

- (1) *beneficence* (requiring actions which promote the good of the patient);
- (2) *non-maleficence* (prohibiting action which will cause harm);
- (3) *patient autonomy* (meaning that practitioners should not interfere with the effective exercise of patient autonomy);
- (4) *justice* (requiring that social benefits and costs be distributed fairly);

¹ One well known form of them was articulated by Tom Beauchamp and James Childress in *Principles of Biomedical Ethics*, (Beauchamp, 1989).

(5) *confidentiality* (patients are to retain control of information generated in connection with their treatment).

One can debate the value of these principles and the concept of a principled approach in general. It can be argued, for instance, that there is a tension between respecting the freedom of the person and securing their best interests. In fact there is a tendency for the third principle to trump all the others, which means, amongst other things, that the practitioner is divested of any significant ethical responsibility. Nonetheless the impact and the value of these principles should not be underestimated. Even though it is not always clear precisely what they imply in a specific situation, they have provided an agenda and set the ground rules for discussion.

What is needed now is a new set of principles which can perform the same function for the new field of Bioethics Mark II that these medical principles have performed for Bioethics Mark I. There is a need for a set of principles which will provide a single, theologically sound² and generally acceptable foundation for the whole field of gene technology ethics. .

Biotheological principles

The present aim is to establish a set of principles which will provide a framework for ethical and theological reflection on all levels of life and being—human, animal, plant and inanimate, both present and future. They are:

- (1) respecting the intrinsic value of all life;
- (2) valuing human uniqueness;
- (3) preserving organismal integrity;
- (4) recognising ecological holism;
- (5) minimising future liability; and
- (6) producing social benefit.

These principles operate in the same way as the biomedical principles of beneficence, non-maleficence and so forth. That is, they do not automatically provide an answer for all the specific issues that can be raised, but they do provide a framework which controls the form of the discussion and they provide guidelines as to the essential issues that need to be addressed. The following brief outline of the six principles can only elaborate briefly on the rationale for including the various principles and on the kind of issues they can address.

1. Respecting the intrinsic value of all life

The first biotheological principle opposes the idea that life forms only have value as they have value for people. This is a fundamental principle which is in accord with an understanding of the world as 'creation' rather than simply as 'nature'. Value is derived from the fact of divine creation and from God's

² Interestingly, Christian theologians were very involved in the early development of the field of bioethics in the 1970's, but that contribution has diminished over the years and bioethics has become, in many places, a secular field and the Christian contribution, where it exists, is reduced to an ethical commentary, and often the ethical dimension is reduced to being purely utilitarian in form.

evaluation of the world as 'good' (Gen.1:31). This is a principle which needs to be re-affirmed because at various times it has been denied by reductionist science, anthropocentric theology and Cartesian philosophy.

The first of these is an understanding of life in purely physical terms, with respect to DNA, the movement of atoms, molecules and nerves and so forth. It effectively eliminates all human significance and intrinsic value for living things. The second is a theology which operates from a point of view which stresses the human soul to the point where the value of other parts of God's creation is diminished. While it has been suggested that this is what lies behind most of the ecological problems of the present³ it seems, without denying all Christian culpability, that it is the third approach which has been more damaging, albeit partly through influencing the Christian approach.

Descartes argued that the human body was simply a machine made out of dead matter. The body operates not so much by what we would understand as biological principles but by purely mechanical principles. According to his mechanical philosophy of matter nothing is inherently alive, neither human bodies nor plants or animals. The life of the person lies entirely in the immaterial soul which inhabits the body and which controls the body through the pineal gland, a small gland at the centre of the brain. Descartes believed that it moved, twisting and turning, literally pulling strings that mechanically control the body's movements.

Descartes' mechanistic philosophy has been profoundly influential in the modern era. Its anthropocentrism is such that the natural world is seen as existing to serve, be used and consumed by humanity. This stands in contrast to the biblical view of the value of the whole of creation and the expectation of the redemption of all things. In recent times the anthropocentrism of Cartesian philosophy has been challenged by zoocentric approaches (the view that sentient [vertebrate] animals also have intrinsic value), biocentric attitudes (all living beings have intrinsic value – they have a good of their own) and ecocentric philosophies (where the emphasis is on species and ecosystems having intrinsic value, not only the individual organisms). The truth, and the limitations, of these various approaches can be best be integrated in a theocentric approach in which the intrinsic value of all life is related to the life and action of God.

The theological challenge to anthropocentric tendencies can be related to recent shifts in trinitarian theology towards stressing the sociality, the diversity and the immanence of God; this is in contrast to more traditional approaches which tended to stress the unity, the hierarchy and the transcendence of God. There is no fundamental contradiction here, but a shift of emphasis can significantly alter one's understanding of the way value is derived from the life and action of God. Where hierarchy and transcendence are stressed, the work of creation is traditionally associated

³ Peter Singer blames Christianity for the widespread presence of this kind of anthropocentrism (Singer 1990).

with the Father, and a hierarchy is created within God (with the Father above Christ and the Spirit), and humanity (with male above female) and the created order (with humanity above animals and animals above plants).

Recent trinitarian thinking has tended to shift the emphasis towards relationship and immanence and in terms of the created order this means a greater recognition of the fact that creation is a wholly trinitarian process. The Father creates through the Son in the power of the Spirit; through the diversity of the Trinity it is possible to re-discover the mystery of the presence of God in the world, the community of human life and an existence of the world in God (see Prov. 8:22–31; Col. 1:15–20) which stresses the value of the whole of creation and not merely the value of humanity.

This provides the basis for an eco-theology which values all species and forms of life and which supports their care and conservation. However, a theology of creation requires as a corollary a theology of re-creation, the transformation of the world by God. One cannot exist without the other. A Christological understanding of this transformation involves the death of one entity to bring about another. This is not only applies spiritually (which includes the physical) but also scientifically as any understanding of life rationally requires an understanding of death.

A theology of death recognises, amongst other things, that the world is dynamic and changing and that God is a life-giver who leads the world on into new ways of being through death. This is consistent with the fact that at the level of *individual cells* a person's good health, life and growth depends upon the death of body cells. The unfettered reproduction of cells would lead very quickly to the death of the individual. That is the problem of cancer. Built into our individual lives is a death which allows life. Moreover, at the level of *individual organisms* (plants and animals and persons) there is a cycle of life which through degradation, corruption and composting – call it what you will – means that new life is made possible.

With regard to *species*, there also seems to be a value to extinction. While biodiversity has increased (when one starts with few and simple there is only one way to go) there has always also been an associated loss of species. At times this has almost been catastrophic but this should not necessarily be seen as entirely negative. Large scale fluctuations are vital to the dynamics of large systems and can actually promote the development of new and more robust species. Just as death is essential for individual members of any living community, the loss of species may be a natural and healthy aspect of the global community of life.

The theological material underpinning the principle of the intrinsic value of all life thus provides a *prima facie* case for defending all species and believing that the environment is not simply a means to an end. However, it also provides evidence that this is a principle that should not be absolutised and which can legitimately be seen as needing to be understood in relation to other principles. The point is that the individual principles nominated here provide a good basis for reflection but should not be seen as either absolute or as un-related to the others. Together, however, they do provide a foundation on which to build.

2. Valuing human uniqueness

The principle of the intrinsic value of all life is closely related to the second principle which emphasizes the *unique intrinsic value* attributed to the human person individually and as a species. The rationale for this, and the implications of it, can be explored in a number of ways which illustrate the value of interpreting it in relation to the other five principles.

Firstly, it helps in understanding human life in relation to animal and plant life. While the traditional Christian position on human life as having unique value retains currency, it has also been characterized as 'species-ist'. This is a term coined by Richard Ryder and popularised by Peter Singer and it is 'a prejudice or attitude of bias towards the interests of members of one's own species and against those of members of other species' (cited in Sylvan 1994). This view seeks a Copernican revolution in ethics, displacing the human person from the centre of concern. It is argued, on the one hand, that there is no objective criteria for treating humans differently from animals, while on the other hand it claims that sentience is an appropriate measure of value and therefore that certain intelligent animals should be valued more than certain humans (neonates or those seriously intellectually disabled).

A biotheological response to this will deal with traditional anthropological themes, such as the concept of the *imago dei* and the notion of the soul, but will do so in relation to other theological principles relevant to valuing other forms of life. There are exegetical problems related to the *imago dei* which present difficulties when using this as a defence of human value in the public arena. There are very few scriptural references to it, and the concept itself, *imago dei*, it is not clearly defined (Gen. 1:26-27; 5:1-3; 9:5-6; 1 Cor. 11:7; James 3:9).

The paucity of passages does not reflect its traditional theological significance and whatever it means in any more precise sense it does at least mean fairly clearly that there is some sense in which humanity is like God, and that is a profound point to bear in mind. We are persons, not just animals and not just robots; people able to enter into a personal relationship with God in a way that rocks, plants and animals cannot. The *imago dei* does provide a basis for resisting accusations of species-ism, but questions remain concerning the nature of the traditional Christian relationship of the relative value and integrity of the human person to that of plant and animal life.

Christian theology has generally operated with a radical differentiation of value between humanity and the rest of the created order; there is often a de facto hierarchical understanding of the value of the rest of life which appears to derive from this initial distinction and which values dolphins more than bacteria and whales more than mice. What are the criteria used to justify this? This is rapidly becoming a significant issue in the face of both the potential loss of many species from our world, and the presence of alternative philosophies of life.

The history of the world suggests that there is an inherent movement from simple to more complex forms of life. Does this suggest that there is a hierarchy of value related to the complexity and richness of an organism's experience? Does this place humans at the top with amoeba at the bottom, and other animals located variously between with whales, dolphins and great apes closer to the top? The reality of the complexity and richness of experience in evidence in some animals (including relationships, consciousness, language, the use of tools, feelings and affection) needs to be related to both of the principles discussed so far—the intrinsic value of all things and the unique value attributed to persons—in order to be able to adequately present a Christian view on specific issues relating to animals and the environment.

The second area that the principle of human uniqueness can address relates to the acceptable parameters for future human life. The re-creation of the self has started: changing the form of our bodies through surgery, chemicals, hormone-producing implants, prosthetic limbs, organ transplants, xenotransplantation, artificial hearts, pacemakers, bionic ears and, soon perhaps, the replacement of damaged optic nerves in blind people with electronic technology to restore vision. Gene therapy and neurological medication can treat mental disorders and alter sexual orientation - changes which not only affect the body but also personality. What further changes will developments in the rapidly changing field of neurochemistry bring about? Moreover, the process of merging the mechanical with the biological has begun as machines are now implanted into people and made acceptable to bodies through the use of various drugs which suppress the immune systems rejection of them. There are transhumanists who are looking towards a shift in human nature, moving perhaps towards a post-human condition, as well as bioconservatives who see transhuman initiatives as nothing other than de-humanising tendencies. What are the implications of trying to modify personality characteristics so that people are more or less loving, kind, generous, peaceful, angry, evil, selfish or depressed? Not everything that has been suggested as being possible will actually materialize, but obviously significant physical changes are going to be possible, and significant aspects of personality will be affected. To attempt to eliminate attitudes such as 'hate' or 'anger' which cause fighting, strife and war from the human character is to attempt the impossible. Such attitudes are 'context specific'. That is hate and anger can be good and proper attitudes in certain circumstances. We may be angry precisely because we love God or justice or our neighbour who is suffering. To eliminate anger is to eliminate love. Any genetic process which eliminates anger has effectively 'killed' the person - even if there is still a body. It is possible that technology will find new ways of killing people - there is nothing new in that! But I don't believe that the extreme forms of modification that some people look for, or fear, will eventuate. Yet this is not to say that there will not be areas of new discovery and for some time, areas of controversy.

Moreover, the process of merging the mechanical with the biological has begun as machines are now implanted into people and made acceptable to bodies through the use of various drugs which suppress the immune

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Responses to these two issues concerning the relationship of human life to animal and plant life, and the limits of future human nature, will be influenced by the way in which the concept of the *imago dei* is developed. Traditionally, there have been two broad categories of interpretation.

The first sees the image as *substantial*: this view holds that the *imago dei* is imprinted on the person as an image is impressed on a coin. The image is thus some characteristic imprinted on the human person which is intrinsic to who we are. The only issue to be resolved is precisely what that is, whether it is our personality, creativity, rationality, spirituality or something else. The second sees the image as *functional*: this view holds that the *imago dei* is found in the exercise of 'dominion' and 'stewardship' of the rest of creation (Gen. 1:28). It can be considered to be a sub-set of the first view if this particular responsibility is seen more as a *consequence* of being made the image of God than being the image itself.

Both these approaches are strongly related to a theology of *creation* (this is the way that God has made humanity and, by implication, it ought not to be changed by humanity) and it is therefore generally taken as a *limitation* on any sort of attempt to modify to human nature. Cloning, human transgenics, cybernetics and so forth are therefore generally reckoned to be inappropriate.

In more recent years a different strand of interpretation has become much more prominent. It views the image as being more *dynamic* (more like an image in a mirror which can change and be sharper or less clear depending on the conditions) *relational* (based on the reference in Gen. 1:26 to being made as essentially relational beings—male and female) and *teleological* (the image is seen as a future possibility or a goal, something which is to be formed by Christ in us, as in Rom. 8:29).

The more relational and dynamic view of the image is not grounded so much in a theology of *creation* as it is in a theology of *redemption*. It suggests that the reason that there is a difficulty in determining which human characteristic is *the* defining aspect of the image of God in us is precisely because it is not something to be defined in terms of any one aspect of us. The image is not a past tense but a future element and it is formed in us in our being human in being all that we are. There is not one specific characteristic which makes us human; instead, God is found in us in

the whole of life. It is a destiny, a direction, a destination rather than a statement about our origin.

Of course, it is quite possible to see that the two elements, the *substantial and creational* on the one hand and the *dynamic and eschatological* on the other are not necessarily to be opposed or seen as alternates. They can be synthesised. Yet, in terms of working through the implications of the principles outlined here, it is clear that an emphasis on the latter may well encourage some to see a justification for enhancing, developing and changing human nature in a way that the more conservative, creational theology would typically not allow. Once again the principles do not simply provide an immediate answer to every situation, but they do provide a way which might lead to discussion of the issues in an appropriate context which ensures that a comprehensive biotheology can develop.

3. Preserving organismal integrity

This principle of preserving organismal integrity begins by repudiating reductionist notions which deny the significance of those higher levels of life and consciousness which occur when certain levels of complexity of life are achieved. Positively the principle affirms the notion that greater value resides in individual organisms understood as a whole. It is a case of the whole being more than the sum of its parts. This means that a description of people, plants and animals solely in terms of genetic and biological structures is inadequate. All life forms need to be understood in terms of the organism's level of ability to exist, act and, potentially, to be aware.

Once again, the practical ramifications of this principle have to be worked out both in relation to specific issues and in relation to the other principles. Mention has already been made of the possibilities inherent in gene technology and this is an issue that is going to become even more significant in the twenty-first century. Some of the more common reasons for producing genetically modified animals are: to research genes in order to understand more about their function and regulation; to provide animals which can model the effects of new medical and genetic treatments; to provide organs and tissues for human transplant surgery; to produce milk or other products which contain therapeutic proteins or greater nutritional value; and to improve livestock quality. But, of course, one could be much more speculative and imagine all kinds of genetic modifications of a less serious but more popular nature relating to the modification of pets.

Do some things have a right not to be genetically engineered? Is it appropriate to produce a genetically modified blue rose? One could argue for this on the basis of aesthetics (it will look lovely) or utility (it will do good) and this will often involve an anthropocentric perspective (is it good for people?). On the other hand one could consider the intrinsic nature of the rose: is this good for the roses? If it is satisfactorily argued that the introduction of a blue gene does not destroy the integrity of the rose, the question remains as to what change would damage it, and how we would know when that occurred. And if genes from a rose were crossed with genes from a mouse would there be a greater level of concern for the integrity of the mouse?

Qualitative research on attitudes to gene technology shows that public concerns not only involve the usual matters of the physical and health risks related to a new technology, but also extend to a deeper, more existential level of concern about the meaning of human nature and the contravention of fundamental order in the natural world.⁴ It has been suggested that people have a sense of given order which is radically challenged by the possibilities inherent in gene technology and, especially, the novelty of trans-species gene transfer.⁵ This existential concern was expressed in the title of a government report, 'Fish don't lay tomatoes, do they?' (Commonwealth of Australia 2000).

The area that probably causes the greatest concern is the animal-human boundary. Historically, anxiety about maintaining the animal-human boundary was a major source of opposition to Darwin's theory of evolution and the same anxiety was evident in the debate over cowpox vaccination. Yet species boundaries are not necessarily unchallengeable. The definitions of species are often arbitrary. But the breeding boundary is a real (though not absolute) one. Some would argue that evolutionary development means one 'may understand species as provisional and fluid collections of individuals, each species playing its part in a developing process, initiated by God of which we ourselves are a fairly recent product' (Straughan 1999 p. 13).

What is certain is that we are approaching a radically new point in history at which we possess a new power, often referred to as the power of co-creation. Human decisions are now a critical factor in the continuing functioning of the planet's systems and in preserving and extending (or diminishing) the integrity of God's creation.

This principle argues against the unfettered modification of organisms and species. The integrity of organisms as entities must be respected. However, it would be premature to conclude that the value of organismal integrity absolutely rules out genetic modification. It does introduce a critically important attitude of care and respect for all life forms, but none of the principles outlined here should be absolutised.

This biotheological principle needs to be correlated with the values inherent in the other five. Just as the first two principles are particularly related (the value of the human person can only be understood in the context of the intrinsic value of all living things) so too this principle which defends the integrity of individual organisms has to be interpreted in close relation to the fourth principle which affirms an overall cohesion to life as a whole, a

⁴ There should be no surprise at this, especially not from scientists who, themselves are very concerned with finding order in the natural world.

⁵ It has also been suggested that despite this there is also a feeling that in certain circumstances some modifications may be justified – provided that the purposes are the right ones. But also that there is a fair degree of cynicism and fatalism that such conditions are unlikely to be met and that more dramatic and less justifiable changes will occur. See Celia Deane-Drummond (2001).

principle which, as will be shown, places the life of the individual organism in a broader context.

4. Recognizing ecological holism

The fourth principle recognizes the connectedness of all life and opposes those approaches which unjustifiably isolate or preference certain parts of the created order. The most common tendency in this regard is to attribute greater value to those parts of the natural world which have attraction to people, and to attribute lesser value to those parts of the world which appear to have little relationship or attraction to people. The principle of recognizing ecological holism works against such anthropocentrically dominated views.

Taking an ecologically holistic perspective means recognising that life is best understood as a whole, and that the various life forms are intimately related and mutually dependent upon each other. Life is organised in a series of nested systems in which the whole is greater than the sum of its parts, not least because of the significance of the interactions between the parts. Life can only properly be understood from a perspective which embraces the whole.

At the physical level one of the unifying principles for life is DNA. As time goes by, more and more bioethics revolves around DNA and the concept of the gene. DNA links animal, vegetable and human life. Presently there is a trend towards relating organisms according to the levels of DNA similarity. For example there is a 99.4% similarity of DNA between gorillas and humans, 82.9% for cattle and humans, 54.2% for frogs and humans, 14.4% lampreys (jawless fish) and humans, 13.1% sea slug and humans and 15.1% for soybean and humans.⁶ Clearly, the boundaries between species are going to be blurred if distinctions are made purely on the basis of a single percentage. In fact, the actual level of similarity in DNA is not a good indicator of differences between species as there can be a large difference in phenotypic expression (that is, the outward, physical manifestation of the entity) even when there is a strong DNA similarity.

The general point remains, however, that life is united and the power of DNA, which is only just being explored, has made it into an icon for life itself. In popular culture DNA functions as a secular equivalent of the soul – as an independent, apparently immortal, self-replicating dimension of the person which is fundamental to identity, differentiation and character. DNA profoundly affects our life, the age at which we die and the health we have; it determines our sexuality and affects the way it is expressed. Our genes have a continual influence on our personality and perhaps even our religiosity. To some extent DNA is destiny. There should be no surprise that in some places DNA seem to be the locus of the true self'. (Nelkin 1995)

⁶ Figures based on overlap in DNA for beta chain of haemoglobin that consists of a 146 amino acid residue. The actual figures for total overlap of genomes will differ from overlap in DNA that codes for beta chain; they may be higher or lower. (Kimball 2008).

From a theological point of view everything is indeed connected and has to be seen and understood holistically, not primarily because of DNA but because God is All in all and everything is connected to him (Col. 1:15–17). The principle of totality operates here: the part exists for the whole and therefore the good of the part exists for the good of the whole. And all things hold together because they are 'in Christ'. The principle of holism encourages the exploration of the relationship of theological connectedness and physical relationships in the natural world.

5. Minimizing future liability

The fifth principle takes a move away from the kind of values expressed in the first four principles in which there is an attempt to appropriately relate together the significance of the breadth of life in all its dimensions. These first four principles which operate, so to speak, 'horizontally' need to be related to a principle which connects life 'vertically'—a connectedness of life through time. The world of today emerges out of the past and is the basis of the future.

This principle speaks to us of the responsibilities we have for the future. This is a principle which expresses both caution and hope. It is formed in terms of 'minimising future liability' rather than 'maximising future potential'. It could be argued that the latter is a more appropriate way of ensuring benefit for future generations, but maximising any kind of return also increases the risk factor and the speed of development today is such that a more conservative, precautionary attitude is to be preferred.

This is consistent with an approach which has developed in international environmental law known as 'the precautionary principle'. It is based on the concept of taking anticipatory action to prevent possible harm in situations where there is some scientific uncertainty about the outcomes. It is a principle which emerged in German law in the 1970s (as a result of pollution that was crossing national boundaries). Since the 1980s various forms have been introduced in multilateral and international declarations and protocols. It is a principle which can be applied in a wide range of situation, from oil exploration to genetic modifications.

The exact form of the principle is debatable, but the 1992 Rio Declaration on Environment and Development defines it in this way,

Where there are threats of serious or irreversible environmental damage lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

United Nations 1992

There is debate about the extent to which it should be applied in international law (with Europe generally being more favourable to it than the USA) and about what 'certainty' involves and about the degree of precaution involved, but many countries have used it in specific pieces of legislation related to the environment. The Australian Government has incorporated it in twenty-seven different pieces of legislation.

The precautionary principle has application in many areas relating to the environment. It has obvious relevance to any consideration of gene technology. The possibility of unintended consequences has to be considered when dealing with, for instance, genetically modified crops. The possibility of accidental gene flow with impact on other species and the possibility of unintended and ecologically damaging traits has to be recognised. A conservative approach to this technology is preferable. Recalling a defective vehicle is possible but recalling a problem gene is not.

An awareness of:

- (a) God's appreciation of his creation;
- (b) his concern for all generations; and
- (c) his desire to lead his people into the future

means that it is theologically appropriate to have an ethic driven largely by respect for future generations.

Let us think of the world's children when we reflect on and evaluate our options for action.

Common declaration on environmental ethics 2002

This is an important principle which ought to be a part of all biotheological discussions.

6. Producing social benefit

The final principle insists that the ultimate purposes of biotechnological developments are of crucial importance. This principle resists biotechnological development for trivial purposes or for economic gain at the cost of social benefit. The difficulties inherent in this principle, and the more general problem of operating with such a set of principles, can be illustrated by reference to the biomedical principles of beneficence, non-maleficence, patient autonomy and justice referred to earlier.

The principle which requires doctors to 'do good' is actually overwhelmed in practice by the principle of patient autonomy. The practitioner is under great pressure to accede to patient wishes in every situation, and not to do so seems to be 'unethical' as it would conflict with the principle of autonomy. Even if a doctor considers that a particular course of action is not good or helpful they usually feel an obligation to employ it if the patient wishes it. As a consequence, medical practitioners easily become non-ethical dispensers of medical services in which all the principles relating to 'good', 'bad' and 'justice' are interpreted by reference to what the individual patient determines them to be.

The same danger potentially exists with the more corporately framed biotheological principles. 'Social benefit' could become simply anything which a simple majority of the community wants. The fundamental problem in both situations emerges when one principle is allowed to trump the rest. It is important, therefore, that the biotheological principles outlined here should be seen as operating in a more dynamic, egalitarian and interactive manner.

The difficulties involved in the process of assessing social benefit may be illustrated by an unusual situation with regard to the regulation of gene manipulation in Australia. All dealings with genetic material have to be licensed by the Office of the Gene Technology Regulator. The Regulator has to follow a prescribed process of determination with regard to whether an action is permissible. As a result of public discussion at the setting up of the governing act of parliament the Regulator is now *not permitted* to take 'social benefit' into account when making a determination - precisely because of concerns for the community. This somewhat paradoxical approach means that, in theory, any genetic modification, no matter how socially trivial or ridiculous or horrifying can be approved as long as it fits the general guidelines and can be shown to be safe.

The reason for this is that while those who established the Act were concerned that there could be a trivialisation of a serious process, they were more worried that if 'social benefit' was included as a justification for undertaking a particular process that it could end up trumping all other considerations. It was argued that if the perceived benefit was small there would be a conservative attitude towards approvals. But if the perceived benefit was considered to be very large—perhaps a cure for cancer—that there would be a temptation for the Regulator to take more of a risk with a gene modification proposal than they would have done if the assumed benefit was less significant. Indeed, if 'social benefit' was built into the regulations as a factor to be considered they would perhaps be *required* to consider taking a greater level of risk. So the decision was that it was in the community interest to omit reference to community interest!

Given the utilitarian atmosphere of most public debate one can see the logic of this. However, it is hard to see that in the long term, that community benefit will be enhanced if there is no discussion of what it actually involves. The real problem that needs to be addressed is that public ethical debate is typically so focused on utilitarian methodology that other ethical approaches and values are rarely taken into account. The use of the six principles nominated here would provide a way for social benefit to be related to other factors including an understanding of intrinsic value which is not grounded in utility. The principle of social benefit needs to take into the account the breadth covered by the various principles. It also needs to avoid being constrained by national boundaries and deal with need wherever it exists.

Conclusion and continuation

Biotheology is a valid and necessary field of theological endeavour and these six principles have the potential to provide ethical cohesion and theological structure to discussions on biotechnology and bioethics. They will not, by themselves, automatically resolve ethical dilemmas but they do serve to establish the essential parameters and principles which ought to frame the discussion. Further work needs to take place in two ways. Firstly, in terms of the application of these principles to specific issues and, secondly, in terms of fundamental theological issues which these principles raise. It is only possible at this point to briefly outline what I perceive to be

the three most critical theological issues which have emerged in this discussion.

The first concerns developing an understanding *the nature of God's action in the world*. This is a question that is often expressed negatively in terms of the conviction that humanity should not be 'playing God' with gene technology or euthanasia or genetically modified crops. It is possible to identify initially three categories of response to this.

One view interprets humanity as *creatures* responsible to live according to God's wishes and plans and with little or no right to intervene and 'play God' by changing aspects of life and nature. Another view argues that people have now become '*co-creators with God*'. (Hefner 1993) That is, God has intentionally brought into being a creature who represents a new stage of freedom and who acts as co-creator to participate in the intentional fulfilment of God's purposes. This is a view in which humanity is a very active participant in changing the world and it believes that humanity is, in fact, required to 'play God' in the sense of playing a God-given role in the management of this world (Gen.1:28). This is a claim that is deservedly being given considerable attention, but if the first view says too little about human responsibility this one has the potential to say too much. To be designated 'co-creator' with God is to forget the power and the danger inherent in sin.

A third approach suggests that it is preferable to use a more traditional term in a slightly modified way. That is, we are '*pro-creators*' before God. In the usual sense 'to procreate' means to bear children, and in that sense humanity has always had, under God, the power to create life. Just as it has always had the power to kill and so end life. 'Pro-creators' are those who, like a 'pro-consul', stand in the place of another, yet under their authority. The possibilities inherent in the new biotechnologies do not fundamentally alter the principle that humans are to act responsibly as pro-creators, but it does seriously extend the sphere of human influence and the specific possibilities. This is an understanding of the human role which is perhaps less definitive than either of the previous alternatives. It recognises both divine and human responsibility and deserves further consideration.

The second area for work concerns *the meaning of being human* in the light of technologies which can modify human nature or mix human, animal and plant characteristics. It is now of great importance that the person not be interpreted purely from the point of view of a western individualism where the person is defined in terms of an independent, autonomous, self-actuating, self-fulfilling entity.

What it means to be human must be considered from the individual level, the social level and the species level. Bioethics has focused on the first of these with some forays into the second, but the second and third are going to increase in importance in the light of biotechnological developments. Questions about the boundaries of individual life (at the beginning of life with regard to embryos and at the end of life with regard to euthanasia) will soon be joined by serious questions about the boundaries of humanity in social relationship to other persons (to what extent can we artificially share

genes, modify personality and relationships and select aspects of human form and nature) and species (what are the limits of gene transfer and what are the limits of being human?).

The third critical biotheological issue relates to the way that we understand the value and the order of the natural world. Any new technology produces a degree of public uncertainty about the value of change and the levels of risk. However, certain areas of biotechnology appear to create higher levels of existential angst and this occurs when it seems that significant aspects of the order of the world are being challenged. Of particular concern is the human-other organism boundary. As previously noted, when that previously impenetrable boundary is challenged serious questions emerge, and the more a technology contravenes the perceived order the more it is resisted.

Cultural issues are undoubtedly tied up with this. Scientists operating at the molecular level see high levels of similarity in DNA between apparently different species to the extent that some argue that the concept of species is no longer appropriate and that proscribing the crossing of species borders on the grounds that it is unnatural seems scientifically indefensible. More theological discussion needs to take place regarding the significance of perceived order and boundaries within the world.

This brief exploration reveals the extent of the territory to be covered in biotheology. Unless the many and varied dimensions of this field of study are integrated it will forever be disadvantaged. It is hoped that the six principles nominated here will provide a guide for future travellers.

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