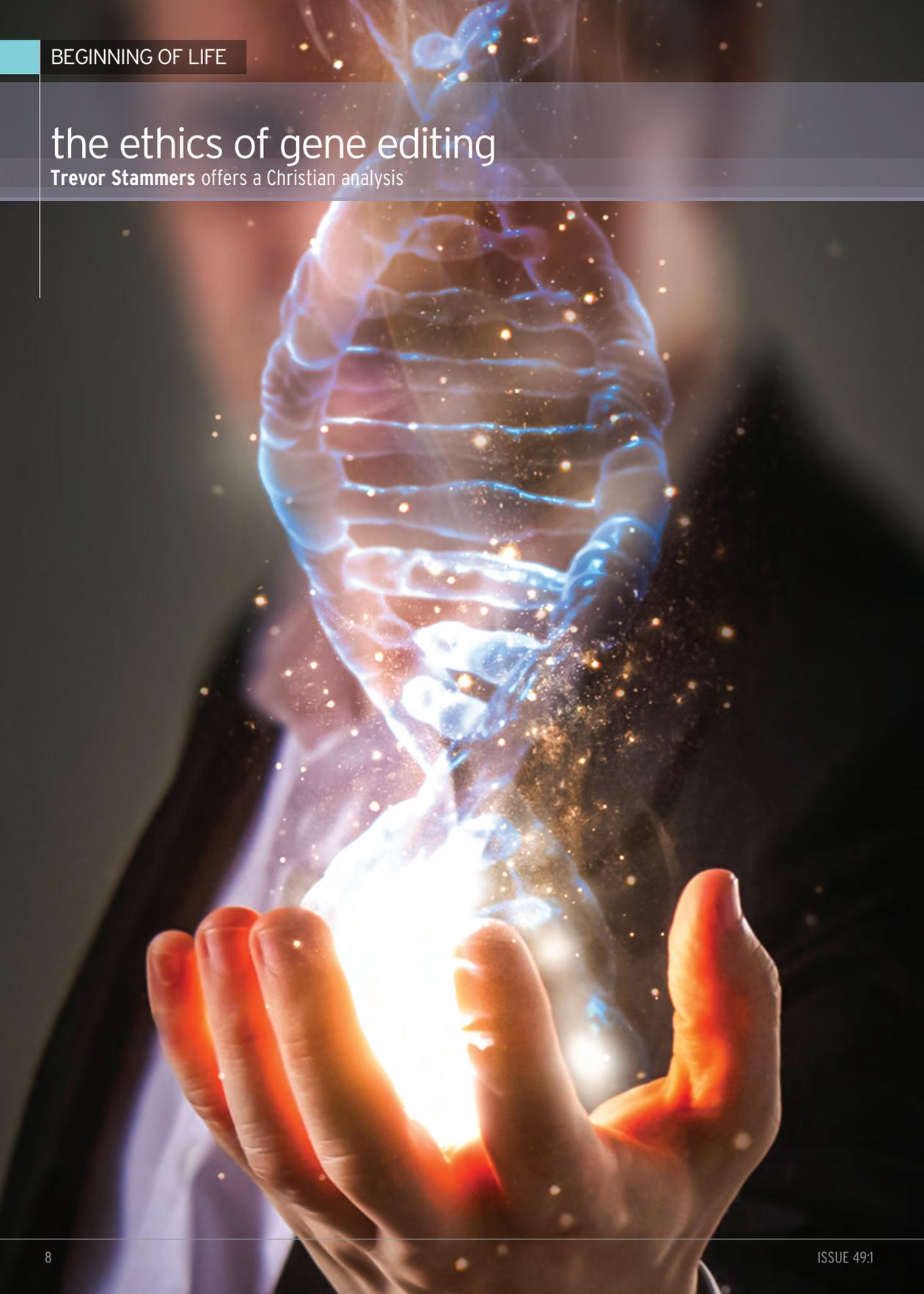


the ethics of gene editing

Trevor Stammers offers a Christian analysis





Trevor Stammers is a Reader in Bioethics, Director of the Institute of Theology at the Centre for Bioethics and Emerging Technologies at St Mary's University, Twickenham, and is editor of *The New Bioethics*.

Before the completion of the Human Genome Project (HGP) in 2003, it was thought there were around 80,000 coding genes for proteins. One of the big surprises of the mapping was the actual number turning out to be around 25,000, and the rest of the DNA was initially written off as redundant and labelled as 'junk'.

However the 2012 publication of the Encyclopaedia of DNA Elements (ENCODE)¹ challenged that dismissive label showing that much of that 'junk' DNA consists of genes for non-coding RNAs involved in regulating protein coding genes.²

The analogy of the genome as the 'book of life' has hence been superseded by less linear ones such as the internet of life where the switches that operate active components may be separated from them by vast distances within the genome.

In 2013, a paper described the use of an endonuclease, CRISPR Cas 9,³ to edit DNA in eukaryotic cells.⁴ Such genetic scissors had been around for years but CRISPR Cas 9 was the first to combine accuracy, economy and speed enabling such rapid progress in the field. It has already led to cures of leukaemia using a virus to add a gene to the patient's immune cells that makes them target cancer cells.⁵

However, the pioneers of genome editing have wider goals than the mere treatment of disease. For most of them, creation of embryos explicitly for experimentation and destruction is ethically acceptable. However, alteration of the germ line (which would pass changes down generations) and genetic enhancement are also on the agenda.

Christian writing on gene editing often emphasises the Genesis account of creation which I now explore using Dietrich Bonhoeffer's 1937 work, *Creation and Fall*.⁶

hype about both the elimination of all genetic disease and the advent of designer babies is likely to remain just that for the foreseeable future

origins: creation and fall

Bonhoeffer emphasises several elements. First, God is distinct from his creation; creation is not a fragment of God. He does not give birth to the universe but speaks it into being. He creates by his word alone.

Furthermore, that 'which is created by the Word out of nothing, that which is called forth into being, remains sustained by the sight of God'. God does not wind up the universe like a clock and leave it to tick on of its own accord; rather 'he holds all creation together'⁷ and 'sustains all things by his powerful word'.⁸

God also speaks life into being - vegetation, sea-life, birds and land animals, all 'according to their kind'.⁹ However, when it comes to the creation of humankind, another element is involved. God creates humankind in his own image, male and female, from the dust of the earth. The human body is fashioned out of earth just like those of other animals, but God breathes his life uniquely into this creature which becomes 'a living soul'.¹⁰

Bonhoeffer singles out two prime elements of what it means to be 'in the image of God'; first, that it means to be free and in particular, free to worship the Creator, and second that it entails the delegated authority of God to rule over creation responsibly: 'I belong to this world completely. It bears me, nourishes, and holds me. But my freedom from it consists in the fact that world to which I am bound ...is subjected to me and that I am to rule over [it].'¹¹

Bonhoeffer's synopsis of the creation narrative ties in surprisingly well with contemporary knowledge of genomics. The account emphasises:

- a) all living things, including human beings, are created out of the clay of the earth. The fact then that the HGP has shown us that there is a huge similarity between the DNA of all species is no challenge to belief in a Creator; the Bible does not encourage us to have too high an opinion of ourselves.¹² It should therefore not concern us that as a species we share over 98% of our DNA with a chimpanzee. We came from the same clay after all.
- b) our physical embodiment is affirmed along with the rest of creation as being very good. It is not a mistake that we have bodies like other animals but rather, this is God's intention. Therefore, we are not to regard our bodies as prisons from which to escape but as a 'temple of God',¹³ through which we are to live for his worship and praise.
- c) despite our genomic similarities with the rest of living things, we are different. Christians have no option but to be 'guilty' of speciesism. Not because we believe other species should be treated in any way we like – there are many scriptural warnings against inhuman treatment of animals,¹⁴ but because we alone have the freedom to rule over and care for the rest of creation and are delegated his authority to do so.¹⁵

Though for Bonhoeffer a key element of being made in the image of God is the reality of human free will, we are not entirely free to do as we please. God sets a limit on that freedom with a prohibition in the form of a tree from which Adam and Eve were not to eat.¹⁶

Adam, though made in the image of God, is not God; Bonhoeffer sees the fall as a rejection of contentment with the *imago dei* resulting in an attempt to be as or like God – *sicut deus*. The price of success for Adam is the ultimate one, as Bonhoeffer explains: 'It is true that man becomes *sicut deus* through the fall but this very *sicut deus* can live no longer; he is dead.'¹⁷ Not only does mankind undergo spiritual death – separation from God – the earth from which humanity was fashioned is also cursed.¹⁸

GO FURTHER

- Gene editing is arguably the most significant medical advance of the millennium to date and it is certainly here to stay.
- As with health and disease, the distinction between therapy and enhancement is not easy to draw. Christian attempts to do so originate from different historic interpretations of the creation and fall.
- While the freedom of the will is a key element of being in the image of God, we are not entirely free to do as we please.
- New developments in genomics have given rise for more reasons to be cautious about genetic determinism.

between therapy and enhancement is not easy to draw. Christian attempts to do so originate from different historic interpretations of the creation and fall. Augustine of Hippo (AD 354-430) understands the fall as entailing the ruin of all humanity as the offspring of Adam, from a state of perfection by Adam's sin of disobedience. This Augustinian schema underpins Professor John Wyatt's analogies of the restored masterpiece and the Lego kit.

According to Wyatt, 'Our bodies do not come to us value free. They are instead wonderful, original artistic masterpieces which reflect the meticulous design and order imposed by a Creator's will and purpose.'²¹ This original masterpiece has however become defaced by the effects of the fall and the task of medicine is to renew the body back to the Creator's original intentions, just as an art restorer does with a damaged painting.

Wyatt contrasts this with the 'Lego kit' view. 'There is no right or wrong way to put the pieces together. There is no masterplan from the designer. There is no ethical basis of Lego construction. You can do what you like. In fact, as the advert says "The only limit is your imagination"'.²²

Furthermore, since there is no natural order within a random, mechanistic view of humanity, the difference between natural and enhanced is obliterated completely.

In the light of Bonhoeffer's analysis, one of the ways we might attempt to discern an ethic of genome editing is to determine whether what is proposed is appropriate to undertake as creatures made in God's image or whether it constitutes an attempt to usurp God's place.

identity, healing and enhancement

'It is a profound misunderstanding of the human condition to think we can optimise ourselves in such a way that all human suffering is abolished', insists Maureen Junker-Kenny.¹⁹ 'It is not good to be alone'²⁰ is the first thing in the creation account that God declared was not good. Our relationships remain a fundamental human need regardless of how high spec our selfish genes might be.

As with health and disease, the distinction

A different view, however, was taken by an earlier Christian theologian, Irenaeus (AD 130-202), who viewed the creation of Adam and Eve as a work in progress.²³ The first stage – that of being in the image of God – is complete. However, mankind is not yet mature and hence imperfect. Thus God's declaration of his creation as 'very good' did not mean for Irenaeus that the world was free from imperfection but that it was perfectly suited to God's purpose of developing us into his likeness. Ironically the very thing that constitutes the essence of sin for Bonhoeffer – mankind seeking to be like God – becomes the purpose of God for mankind in Irenaean thought.²⁴

though our genes do influence everything about us, they do not determine everything we do

The Irenaean Adam has proven very attractive to many contemporary theologians such as Ronald Cole Turner who sees gene editing as having a legitimate role for mankind as partners with God in co-creating our own development: '...the question of the human creature as creator [or 'co-creator'] who contributes to the divine work of creation through new technology, remains an open question, more urgent than ever.'²⁵

genetic determinism

Christianity contends that we are more than the sum of our parts, including our DNA base-pairs. However scientists have often embraced a rather fundamentalist genetic determinism. Francis Crick famously summarised such a view that 'You, your joys and your sorrows, your memories and your ambitions, your sense of identity and free will, are -in fact no more than the behaviour of a vast assembly of nerve cells and their associated molecules'.²⁶

Jockemsen points out several problems here: 'If the DNA sequence contains a message, this presupposes a meaning in the message which

cannot be generated by the mechanism which translates it. Furthermore the DNA has not generated the translation mechanism since in order to be expressed it needs that mechanism. The genetic message itself "needs an explanation – both a final and causal one".'²⁷

New developments in genomics have given rise to more reasons for caution around genetic determinism such as the evidence that non-coding RNAs (ncRNAs) and their effects are influenced by environmental factors including smoking.²⁸ So with both the majority of DNA not coding for proteins and environmental factors influencing the ncRNAs' control of protein-coding DNA, the central dogma of molecular biology of one gene/one protein is increasingly untenable.

This is without taking into account the exploding field of epigenetics. Epigenetics is a field which has borne a range of definitions. Perhaps the simplest is 'the study of heritable changes in gene function that cannot be explained by changes in DNA sequence'. The key point here is that changes to the DNA other than mutations of DNA sequencing, can influence phenotypic changes, some of which are heritable.

Where does this leave us theologically in relation to our human responsibility before God? It surely confirms that though our genes do influence everything about us, they do not determine everything we do.

a Christian view of gene editing

Gene editing is arguably the most significant medical advance of the millennium to date and it is certainly here to stay. Christians are likely to take differing views on particular aspects of it depending on how Augustinian or Irenaean their theology. The goal of healing or enhancement will be another factor in their evaluation, as will the precise details of the technique being used. The correction of a single gene defect either before fertilisation or in the early embryo has already been considered as analogous to fetal surgery in terms of obtaining consent.²⁹ However most gene

editing researchers see the creation and destruction of embryos as an intrinsic necessity in reaching that point, and many Christians will find this unethical – the end point here being neither healing nor enhancement of the embryo involved.

Hype about both the elimination of all genetic disease and the advent of designer babies is likely to remain just that for the foreseeable future. The more that is discovered about the complexities of interactions of genes and their modifiers both within the genome and the environment, the more unlikely the selection of traits such as intelligence or artistic creativity becomes let alone any prospects of moral enhancement.

Moreover, Christians should bear in mind it is not the perfect whom Christ calls to be his people but rather those who acknowledge their sickness and moral failings.³⁰ 'God chose the foolish things of the world to shame the wise; God chose the weak things of the world to shame the strong.

READ FURTHER

- Genes, Determinism and God, Dennis Alexander, *Triple Helix* Autumn 2017. bit.ly/2sRMIEF
- Bryant J, Searle J. *Life in our hands: Christian perspective on genetics & cloning*: Inter-Varsity Press 2004
- Wyatt J. *Matters of Life and Death*: IVP and CMF 2009
- CMF File 49 (2012) – emerging medical technologies: ethical issues. bit.ly/2Grly5t
- CMF File 46 (2011) – regarding the image. bit.ly/2GanVdG

God chose the lowly things of this world and the despised things – and the things that are not – to nullify the things that are'.³¹ No amount of genetic editing will bring salvation from our sin; only the blood of Christ can do that.³² ■

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