

Genes and behaviour

by Caroline Berry and Attila Sipos

With the DNA sequence of the human genome jotted down the hard work now begins of making sense of the data. A critical part of this is establishing the extent to which people's behaviour is determined by their genetic make-up. The relationship between genes, environment and behaviour is vastly more complex than any simplistic concept of genetic determinism. Rather than being pre-programmed gene-machines, human beings are created in the image of a God who will hold us responsible for our actions.

Serious study of the genetics of behaviour started with work on social invertebrates. By observing ants, biologists discovered that co-operative behaviour can be genetically determined and create a cohesive society.

Researchers started to talk about 'sociobiology' when describing how altruism could be inherited; theories that originated with JBS Haldane and WD Hamilton in the 1960s.

Studies on higher vertebrates, particularly birds, show that patterns of behaviour that promote survival within families occur in stressful environments. Life began to be seen as an endless struggle to pass genes from one generation to the next.

Difficult to accommodate under the 'survival of the fittest' model was the self sacrificial behaviour that occurs in the animal world. This is seen when mothers sacrifice themselves for their offspring and when the sentinel wolf is sacrificed for the benefit of the pack.

To explain this, scientists developed ideas of 'kin selection' and the evolution of altruism. It proposes that as relatives share a proportion of their genes, the genes have a better chance of survival to the next generation if one individual enables a relative to survive, particularly if the relative is younger or more fit than oneself. This provides

an explanation of how genetically determined altruistic acts might persist within the family or tribe.

Inevitably these ideas were extrapolated to explain human behaviour, initially by Harvard entomologist EO Wilson,¹ with Richard Dawkins' book the *Selfish Gene*² being more widely known.

It is not only altruism that is said to have evolved. Utilitarian bioethicist Peter Singer wrote 20 years ago: 'sociobiology... enables us to see ethics as a mode of human reasoning which develops in a group context... Its principles are not laws written up in heaven...'³

Edward Wilson, in his most recent book *Consilience* explains this view well. He believes that our choices between 'good' and 'evil' are in reality determined by our genetic endowment and our culture. As individuals, we have little freedom of choice. God is seen as a tribal chief with his power reinforced by myth and religious organisations.

We can see that insects could be 'hard wired' with their behaviour largely genetically determined. But what determines behaviour in higher animals, in particular human beings? and how should Christians respond to the claims of people like Dawkins, Singer and Wilson?

Human Behaviour

Towards the end of the twentieth century studies suggested that genetic factors were relevant to a number of psychiatric disorders such as depression, alcoholism and panic attacks.⁴ These studies compared identical and non-identical twins, and compared children with either their biological or adoptive parents.

Today molecular genetics is the tool of choice and as work on the human genome proceeds, many of the single gene disorders have had the genes responsible for them identified.

Attention is now turning towards the commoner but much more complex diseases such as diabetes, heart disease and asthma. Here we find multiple genes interacting with environmental factors so we can no longer talk of 'genes for' but rather 'genes associated with' or 'predisposing to'.

This group of illnesses also includes schizophrenia, depression and anxiety disorders. Despite years of extensive research, no-one knows what causes them.⁴ Part of the problem is working out how to

define the borderlines between health and disease. Severe schizophrenia is a devastating medical disease that responds to drug treatment, but those with milder forms may be viewed just as eccentric individuals.

Depression is even more intangible. When severe it is a serious disease, which again responds to medication. Feeling depressed can, however, be an appropriate response of healthy people who find themselves in stressful environments.

A question of shape

Our knowledge of brain chemistry and the function of substances like dopamine and serotonin is increasing. Current research focuses on identifying receptors and tries to establish their physical make-up.

We know that the exact shape of a drug receptor influences the effectiveness of its response. Variations in the molecular structure of receptors and other cellular molecules will therefore affect the strength of our response to our natural hormones and 'chemicals'. But as we have already seen, these correlations are likely to be highly complex and dependent additionally on environmental factors.

Recently developed research tools are just beginning to provide a way of looking to see how specific genes interact with specific features of the environment.⁵

Being me

While genetics is certainly involved in disease, could it also determine aspects of our personality? After all, we frequently read in newspapers of scientists finding 'the gay gene', 'the gene for aggression' or 'the gene for risk-taking'.

Sadly the excitement generated by these reports is out of proportion to their scientific validity. In addition repeat studies often fail to confirm the findings and these receive little

publicity. Some of the hype is driven by the media's need for sensational news, and partly by extreme press releases sent by either the scientists themselves, or by journals that published the study, seeking to draw attention to the work.

It often requires a few years from the initial announcement of a discovery before objective conclusions can start to be drawn.

For example in 1996 it was proposed that a variant of the dopamine D4 receptor gene was associated with novelty seeking.⁶ The finding was confirmed by some but discounted by others⁷ and explanations for the discrepancies then put forward.⁸ At the same time other observers were commenting that homosexual orientation was most probably influenced by both biological and psychosocial factors.⁹

Whatever the current state of ignorance, everyone accepts that increasing knowledge of the human genome will show that some genetic factors relate to certain behaviours.

Nature or nurture?

Most parents spot different characters in their children almost from birth. As adults, we regard certain personality traits to be inherently part of us (nature) rather than induced by our upbringing (nurture), although the marks of our upbringing may also be discernible.

Deciding the relative impact of nature and nurture is never straightforward. For example, children with William syndrome have mild learning difficulty, early excess calcium in their blood and heart defects. The syndrome was first described in 1961, and characteristically the children are sociable and form easy if superficial relationships with adults, so that their conversation skills often mask their learning difficulty.

This syndrome arises because the elastin gene (and probably others) is deleted from chromosome 7. Does the excess calcium during fetal life cause their behaviour? Or is it the

lack of elastin, or the loss of some as yet unidentified gene? Or do their facial features cause parents to respond in a way that generates the behaviour pattern during infant development?

Unravelling behavioural genetics is never going to be easy.

Repercussions

Identifying genetic links to various behaviours could affect the legal system. How, for example, will it handle pleas based on diminished responsibility because of the accused's genetic make-up?

In 1993 researchers found that members of a Dutch family with a strong family history of violence had a mutation in the structural gene for mono-amine oxidase, an enzyme known to affect mental function.¹⁰ If accused of a violent act, should such people be found innocent because they cannot be held responsible for their actions, or should they be imprisoned because they are dangerous to the public?

Groups with an interest in the identification of genes that predispose towards homosexual orientation see good and bad in their possible discovery. A genetic cause might encourage acceptance of their lifestyle, but it equally raises the spectre of parents requesting selective abortion for its elimination, or using genetic manipulation, to change the nature of their offspring.

In its Public Consultation Document on Behaviour Genetics,¹¹ the Nuffield Council for Bioethics presents the possibility that greater knowledge of inherited behaviour traits might lead to society creating boundaries of acceptability. This could label certain patterns of behaviour as medical conditions and cause us to narrow down our view of what is normal and acceptable.

Many years ago, referring to physical traits, Stanley Hauerwas coined the term 'the tyranny of the

normal'. This tyranny could be even greater if society, with its differing and changing values, were to lay down behavioural norms.

Refutations

Sociologists such as Steven Rose¹² caution against jumping-on-the-bandwagon of genome research, and point to the foolishness it may cause.

Rose stresses that genetic and environmental influences may be closely entangled. He is concerned that focusing on genetic aspects of

A generation ago a tongue in cheek article appeared in the *Journal of Dental Research* showing confidently that attendance at the dentist was controlled by a single autosomal dominant gene.

human behaviour may prevent us from trying to remove obstacles to human achievement such as poverty and lack of educational opportunities.

These concerns have been raised by sociologists over the years and they should be echoed by Christians as they seek to serve the interests of weak and vulnerable people.

Further reflection on human behaviour identifies many facets that can hardly be attributed solely to our genetic make-up. Our appreciation of art and music and our ability to sacrifice ourselves for intangible ideals such as universal suffrage and the abolition of slavery are just some examples. As Francis Collins, the current Director of the Human Genome Project, and a committed Christian said when announcing the mapping of the Human Genome to the world's press in February 2001: 'The human genome will not help us to understand the spiritual side of humankind, or to know who God is, or what love is.'

We know too that people are able

to change their behaviour. This may simply be by dogged determination to master an undesirable trait such as a short temper, but may come about by a more profound change of direction resulting from religious conversion or even the new self awareness induced by becoming a parent. We do have freedom to choose and with that freedom comes responsibility to choose the good.

A Christian Response

These new developments raise serious theological issues.

Is our Christian morality and belief in God simply a response to behavioural patterns laid down in our genes? Are we really nothing more than machines that simply transfer our genes to the next generation? Do we have free will or are we simply driven by our programmed traits?

God creates, sustains, raises

However our ethical imperatives may have arisen, the important factor is whether or not God is creator and sustainer of the Universe and whether his son Jesus came to this earth, died for our sins and rose again.

It is this rising from the dead, his resurrection, which is the crucial point. If this happened the shackles of biological existence are broken. Whether or not biology has contributed to our understanding of the right way to live is interesting but ultimately immaterial. God uses biological mechanisms in his creation, but biology is eventually put in its place by the resurrection.

What the Bible teaches

If God is indeed alive and reigning, then it is right to put biological data in the context of teaching in Scripture on our humanity, where we

see human beings as 'a little lower than the angels'¹³ and being 'made in the Image of God'.¹⁴

Any move towards a reductionist view, where people are seen as programmed by their genes, takes away the inherent humanness and dignity that comes with being made in God's image. God showed his love for us by giving us the freedom to be responsible adults rather than pre-programmed robots.

God is Spirit, so clearly our being made in his image gives us more than is in our DNA. There is more to our humanity than our biological make-up even though it is difficult to elucidate the exact nature of this inherent quality.

In Genesis¹⁴ God takes the dust of the earth, and then breathes into it so that it becomes a living soul. This seems a two stage process. Is this dust the genetic blue-print, so much of which we share with the rest of creation, 'upgraded' in some way by the Creator's breath?

Genesis focuses on our creation 'in the image of God'.¹⁵ The man and the woman (but not the animal creation) walk with God in the cool of the day... a picture of relationship and companionship. We are created for relationship with God and not simply for the transmission of our genes.

Freedom and choice

In the Garden the Man and the Woman were given the freedom to exercise their free will and make choices. They were given the opportunity to choose either to do right or to do wrong. However we interpret this story it shows that the freedom to choose is an essential part of our humanity. Likewise our genes may give us individual strengths and weaknesses, but they do not deprive us of the responsibility to make good or evil choices.

Throughout Scripture we see God's concern to meet individuals whatever culture or circumstances they are living in. Old Testament characters such as Noah, Ruth and Esther and people in the New

Testament such as Nicodemus and the woman by the well of Samaria were never given an opportunity to avoid his claims on grounds of their learning or culture.

Scripture emphasises our weakness and need for dependence on God without in any way diminishing our responsibility for our actions. The man born blind¹⁶ was to glorify God through his disability and healing, while those with talents are called to use them for him.

We ought to regard both ourselves and our neighbour in this light. We are each valued by God and expected to serve him in a unique way appropriate to our particular genetic make-up. It is our responsibility to put this into practice. Taking responsibility for our choices is an essential part of our humanness.

Needing self-discipline

Ted Peters in his book *Playing God?*¹⁷ makes a point that needs to be emphasised in today's Nature-glorifying society. He emphasises that just because something is 'natural' does not make it right.

The book has a masterly chapter on Scientised Morality. Taking a hypothetical 'gay gene' as an example he considers the proposal 'my genes make me innocent'. If I am born with a certain tendency then, as I have no responsibility for how I am born, surely I am not responsible for my actions?

But where does this attitude lead? He shows that the road now forks, with one branch leading to the argument that 'if it is natural it is

normal and therefore OK,' and the other leading to society declaring that the natural is in some cases undesirable (as might be said if the gene being considered was one which predisposed to homophobia).

Nature by itself does not answer our questions about what is good and acceptable. This will simply be decided by the society of the day. Thus the apparently liberal approach in the end endangers those who are too vulnerable or weak to be heard.

The alternative proposal is to say that 'my genes make me guilty' and the concept that 'the biological make-up with which I was born saddles me (saddles each of us) with a moral hurdle to overcome'. He stresses the need for God to help us leap this hurdle and accept the need for self-discipline.

Peters believes that the very concept of self discipline presupposes the existence of a self that can engage in self discipline. Thus we have responsibility for our genetically influenced behaviour, but he concludes '...we are not alone in pursuing what is good. The power of the Holy Spirit is available to aid us'.

So we may well have inherited predispositions to various behaviours, indeed it is likely that these will eventually be identifiable, but we can be positive and can rejoice with Paul in Romans chapter 7 where he describes the conflict between his two natures, the one pulling him to do wrong and the other wanting to do right: He concludes: 'Who will rescue me from this body of death? Thanks be to God - through Jesus Christ our Lord.'¹⁸

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