

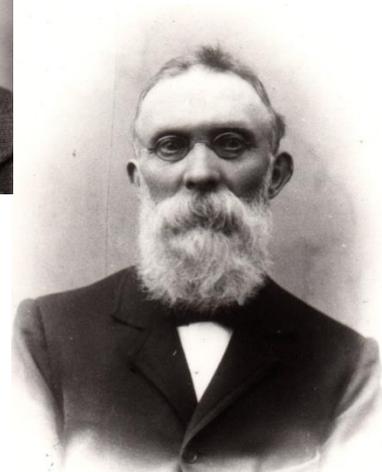
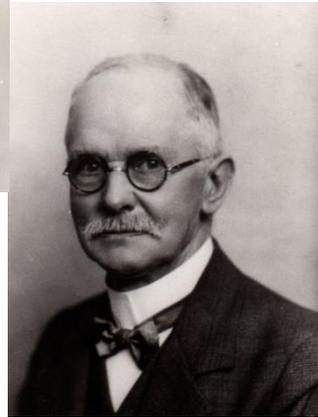
Genes, Free Will and Human Identity: Do scientists have a right to change our genes?

Keith Fox

*Professor of Biochemistry, University of Southampton
and*

Former Director, The Faraday Institute for Science and Religion, Cambridge

Personal identity

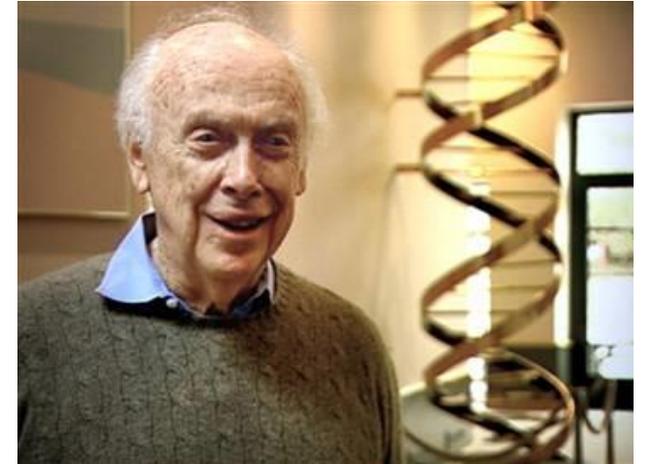


Profession
Appearance
Character
Location

Can I blame my genes?

“We used to say think that our fate was in the stars. Now we know in large measure, our fate is in our genes.”

James Watson



Have you had your DNA tested?



HEALTH + ANCESTRY SERVICE

What can your DNA say about your health?

Learn more about your health, traits and ancestry, with a package of 125+ reports that only the 23andMe service offers.



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35+ reports

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25+ reports

How to Give a DNA Testing Kit as a Gift: How-To, Tips, and Ideas

Christmas DNA Sale

Only £49 ~~£75~~

FREE SHIPPING
on 2+ kits

Order Now



Early Bird Christmas DNA Sale
Only £49 ~~£79~~

A large, detailed image of an AncestryDNA DNA Activation Kit box. The box is white with the brand's logo and a stylized 'X' symbol. It is wrapped in red and black gift paper with gold patterns. The background is a dark wood surface.

This Christmas,
GIVE THE GIFT OF FAMILY

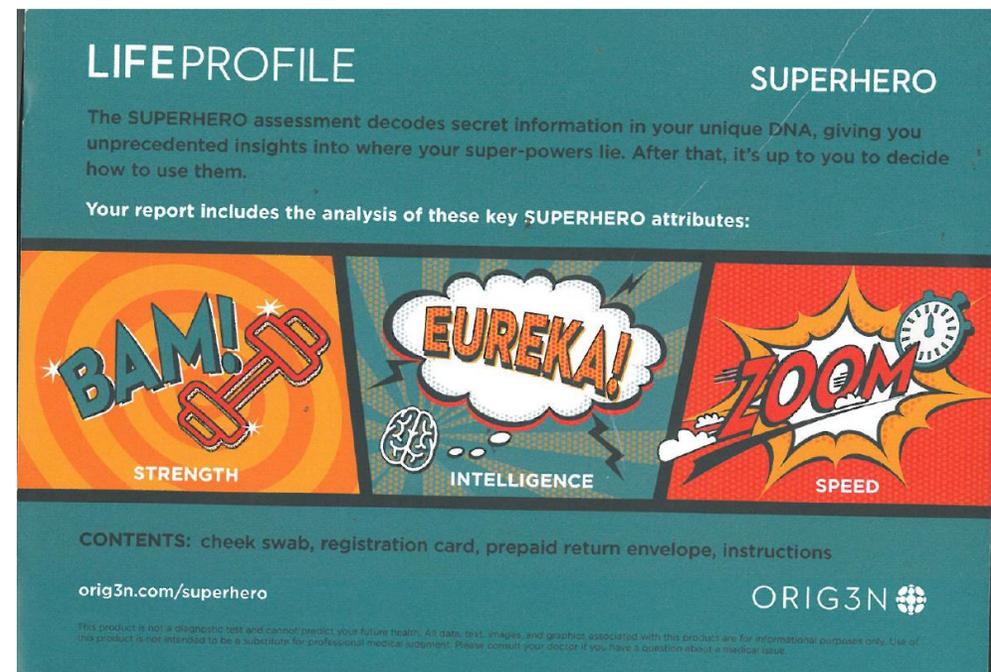
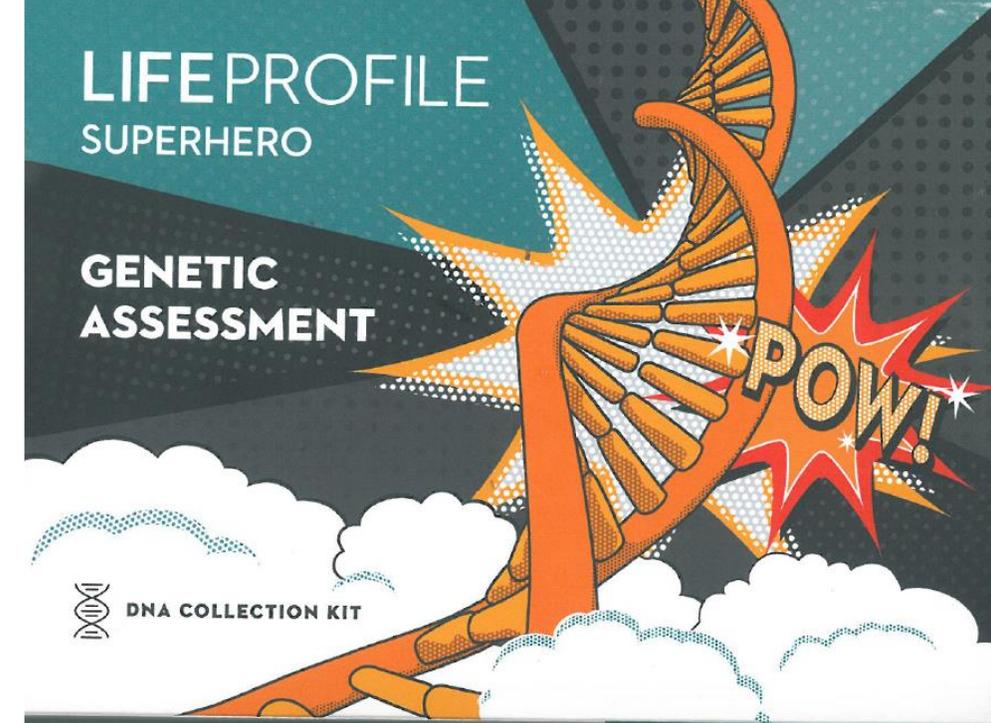
Let your loved ones discover their connections to the people and places in their past

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The superhero assessment decodes secret information in your unique DNA, giving you unprecedented insights into where your super-powers lie...

This product is not a diagnostic test and cannot predict your future health... Use of this products is not intended to be a substitute for professional medical judgement. Please consult your doctor if you have a question about a medical issue



It's in their DNA!

The **love-cheat gene**: One in four born to be unfaithful, claim scientists
Daily Mail, Dec 2012

'**Gangster gene**'
The Sun Jan 2009

The **mean gene**: The gene that makes people stingy with their cash
Daily Mail Nov 2010

From genes to hormone levels, biology may help to shape **political behaviour**. *Nature 2013*

Ciggies? It's all in your genes
The Sun Aug 2007

Gluttony gene: May be behind big appetites
The Independent March 2012

Liberal genes
The Guardian Oct 2010

Geneticism Gene
A gene that predisposes people to think that everything is determined by their DNA

Suggests determinism:
Please.... Don't use that phrase!

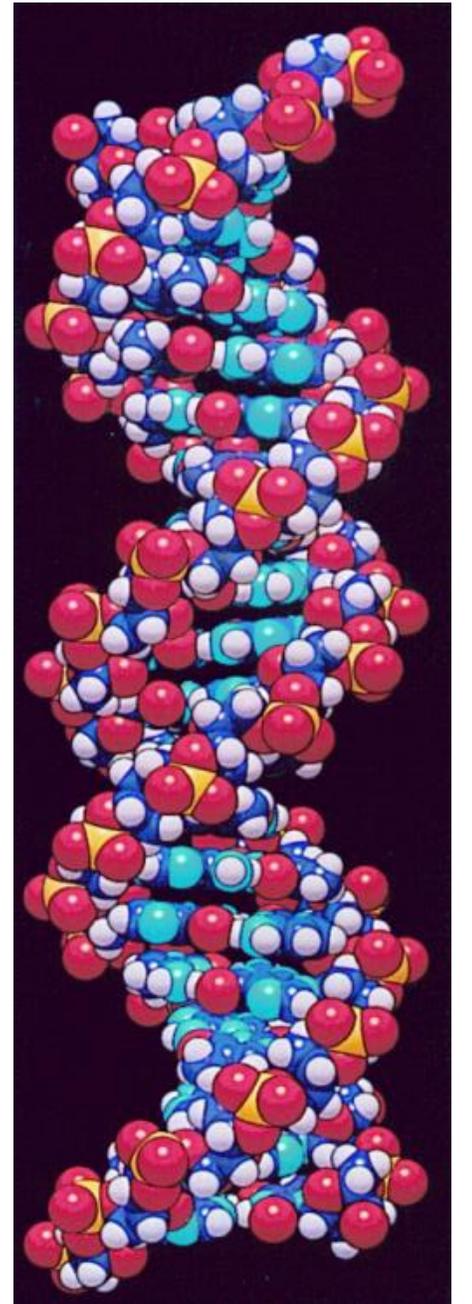
Determinism or Free-will

Free will:

The ability to make choices that are not externally determined

The ability of agents to make choices unconstrained by certain factors

Do our genomes determine our choices?



Robert Plomin

Blueprint

How DNA makes
us who we are



“DNA isn’t all that matters but it matters more than everything else put together”.

“Nice parents have nice children because they are all nice genetically.”

Based on Genome Wide Association Studies (GWAS) and polygenic scores

- Probabilistic, not deterministic
- OK for populations, but not for individuals

Can I blame my genes?

Genes may affect our potential,
But we remain responsible for our actions.

Escape from determinism?

“We are the only ones who can escape from our genes, and so we have doctors, social benefits, hospitals....so we can tame and overthrow the tyranny of natural selection”

I am different to Washington. I have a higher, grander standard of principle. Washington could not lie. I can lie, but I won't.

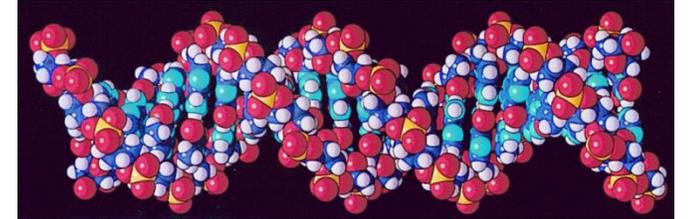
Mark Twain

DNA is NOT a blueprint

- DNA contains the information needed to produce proteins and to regulate their production.
- Genes are parts of a complex system – they do very little by themselves.
- Traits emerge from the interactions of genes and developmental and environmental factors.
- DNA contains basic information that, when combined with the other organic structures will facilitate the growth of a single cell into a multibillion-cell person.

Genetic reductionism

- The 'gene for' fallacy – the false idea that Genes-Я-Us.
- Deification of DNA
- This suggests that we are no more than just the sum of our genes?
- It subscribes to genetic fatalism



DNA neither cares nor knows. DNA just is. And we dance to its music.

Richard Dawkins, *River Out of Eden* p133

Our genes may limit our abilities – but we are much more than the sum of our genes

What Genetic Changes Made Us Uniquely Human



Special Section

We're in the age of the genome, but we can still recognise that **it takes much more than genes to make the human**"

What Genetic Changes Made Us Uniquely Human: Science 2005 Elizabeth Culotta

“Genes for....”

Friendships Moderate an Association between a Dopamine Gene Variant and Political Ideology

Jaime E. Settle University of California, San Diego
Christopher T. Dawes University of California, San Diego
Nicholas A. Christakis Harvard University
James H. Fowler University of California, San Diego

The Journal of Politics, Vol. 72, No. 4, October 2010, Pp. 1189–1198

combination of variants associated with political ideology have so far been identified. Here, we hypothesize that individuals with a genetic predisposition toward seeking out new experiences will tend to be more liberal, but only if they are embedded in a social context that provides them with multiple points of view. Using data from the National Longitudinal Study of Adolescent Health, we test this hypothesis by investigating an association between self-reported political ideology and the 7R variant of the dopamine receptor D4 gene (DRD4), which has previously been associated with novelty seeking. Among those with DRD4-7R, we find that the number of friendships a person has in adolescence is significantly associated with liberal political ideology. Among those without the gene variant, there is no association. This is the first study to elaborate a specific gene-environment interaction that contributes to ideological self-identification, and it highlights the importance of incorporating both nature and nurture into the study of political preferences.



“An increasing number of studies suggest that biology can exert a significant influence on political beliefs and behaviours, ... genes could exert a pull on attitudes concerning topics such as abortion, immigration, the death penalty and pacifism”.

Nature 490: 466-468

NEWS FEATURE

466 | NATURE | VOL 490 | 25 OCTOBER 2012

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The anatomy of politics

From genes to hormone levels, biology may help to shape political behaviour.

“it is difficult to change someone’s mind about political issues because their reactions are rooted in their physiology”.

Belief in genetic determinism tends to lead to more conservative political ideologies.

- If human nature is fixed by our genes then we cannot change society
- The problems lie not in the structure of society, but in some of the individuals who make up society. The solution is therefore to change, or even eliminate, the individuals, not to challenge existing social structures.

We are not just defined by our chemical make-up, but by our relationships.

“a person becomes a person through persons”.

Umntu ngumuntu ngabantu Xhosa proverb

(Just as DNA in itself does nothing, except in the context of a cell, and a cell does nothing interesting, except in the context of an organism, so we are define by our relationships).

We find our true identity in relationship with God, who knows us and gives us identity, worth and significance.

Life isn't fair!

Some people are born with inherent genetic advantages (athletic, musical, intelligent, attractive)

Others have profound genetic disabilities and disease

Should we try to level the playing field?

Not necessarily introducing new genes, but optimizing the distribution to get the best combination of natural genes

Hope for genetic cures?

Genetic disorders

- There are between 4,000 and 6,000 diagnosed genetic disorders.
- About 1 in 25 children is affected by a genetic disorder
- Some genetic disorders are apparent at birth while others are diagnosed at different stages of life.

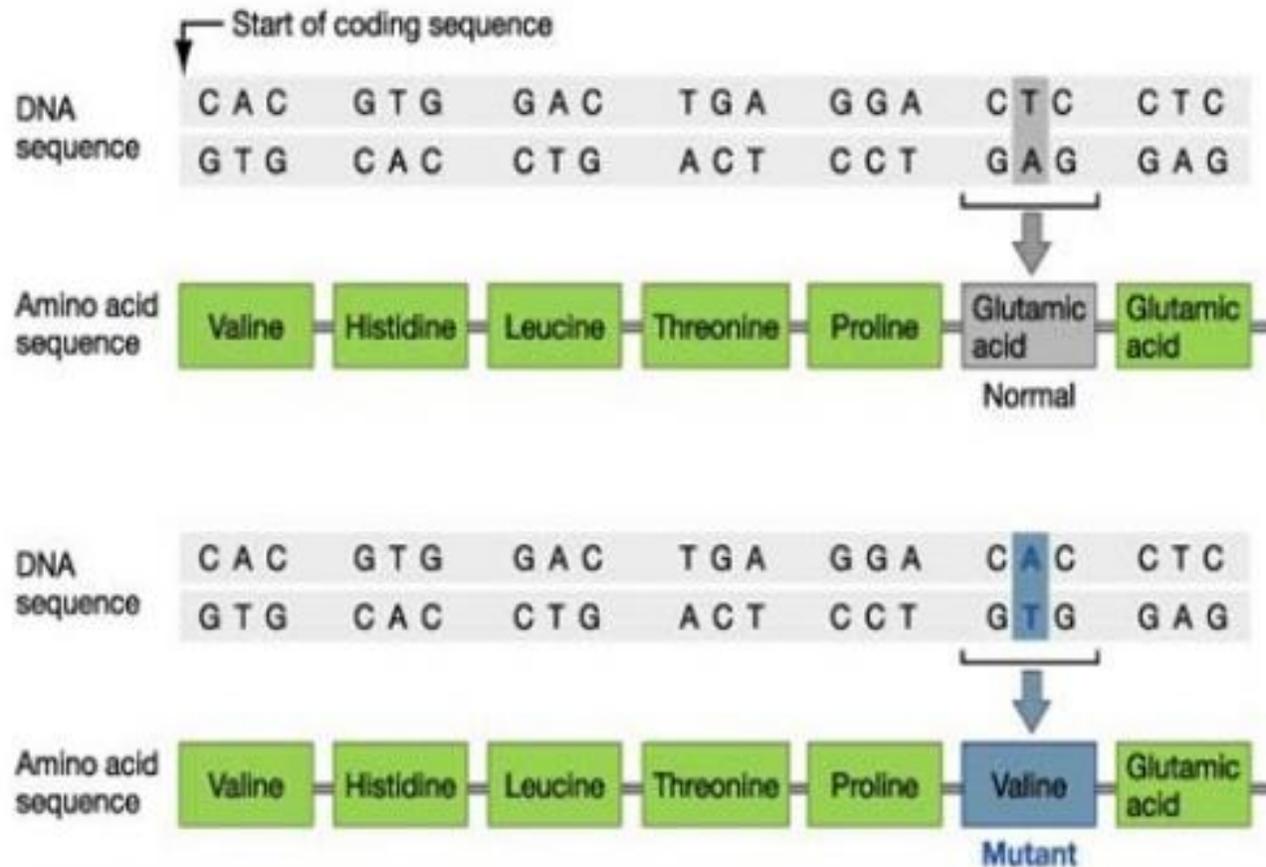
Cystic Fibrosis
Fragile X syndrome
Haemophilia
Huntington's
Duchenne muscular dystrophy
Sickle cell anaemia
Thalassemia
Tay-Sachs
Down syndrome
Angelman Syndrome

The human genome is over 3 billion bases long and a change in only one of these can have devastating consequences

Disease mutations

Point mutations

e.g. Cystic fibrosis, sickle cell anaemia, Thalassaemia
GAG (Glu) – GTG (Val)



Gene editing tools

What if we could cut out/replace a faulty gene, using 'molecular scissors' and 'cut and paste'?



TALENs

Transcription activator-like effector nucleases

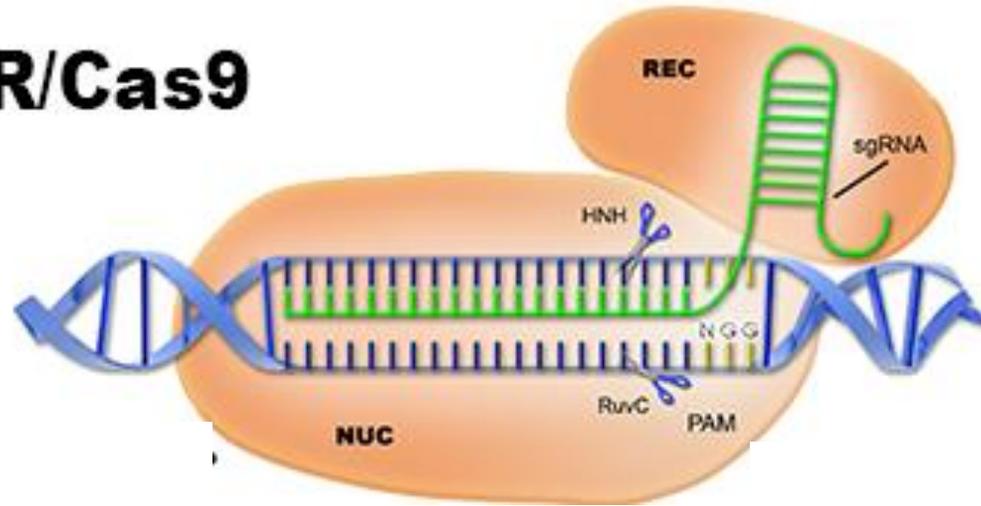
ZFNs

Zinc finger nucleases

CRISPR–Cas9

Clustered Regularly Interspaced Short
Palindromic Repeats

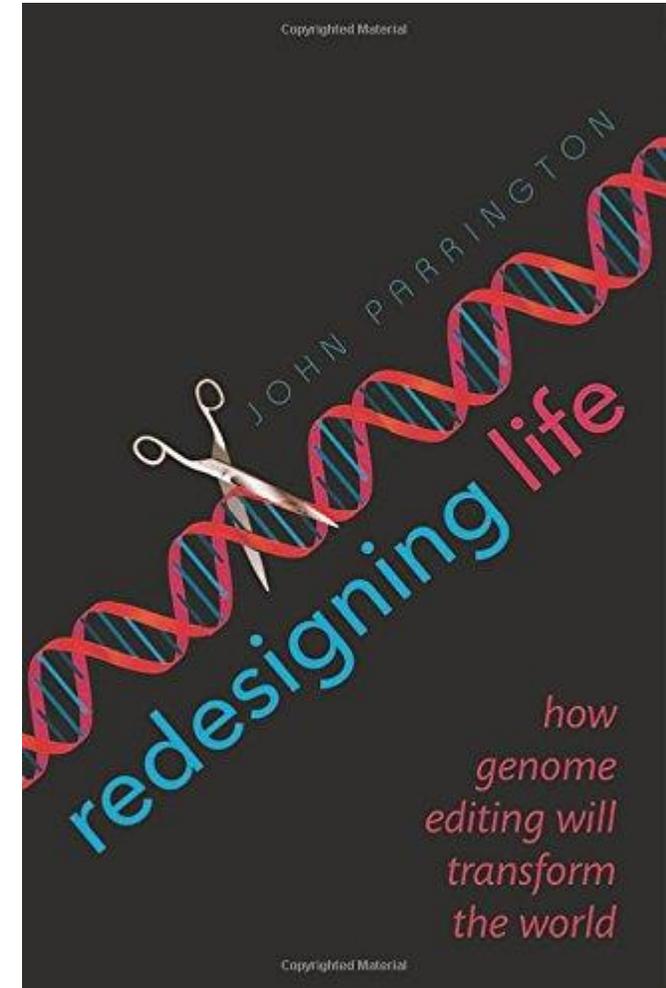
CRISPR/Cas9



<https://www.aati-us.com/instruments/fragment-analyzer/crispr/>

... every once in a while, a scientific discovery is made whose impact on society is likely to be so immense that even an abundance of superlatives may not do it full justice. Genome editing looks set to be such a discovery.”

John Parrington, Oxford



[Daily news](#) 5 November 2015

Gene editing saves girl dying from leukaemia in world first



Layla Richards

UCART19, an allogeneic “off-the-shelf” adoptive T-cell immunotherapy against CD19⁺ B-cell leukemias

Knockout the TCR alpha gene
Knockout the CD52 gene makes donor T-cells resistant to the alemtuzumab.

T-cells are engineered to co-express the RQR8 gene as a safety feature, with the aim of rendering them sensitive to the monoclonal antibody rituximab.

Germ cells/Somatic Cells

Somatic Cell Modification

- Occurs in body cells
- Only affects the individual
- Cannot be passed to offspring

But:

- Delivery to many cells required.
- Technical difficulties

Germ Cell or Embryo Modification

- Gametes or early embryo
- Affects the individual but will be passed to all future generations

- Delivery only to a few cells
- *In vitro*

What about germ cells or early embryos?

In April 2015, Chinese scientists announced that they had used CRISPR to engineer human embryos



CrossMark

Protein & Cell

Protein Cell 2015, 6(5):363–372

DOI 10.1007/s13238-015-0153-5

RESEARCH ARTICLE

CRISPR/Cas9-mediated gene editing in human tripronuclear zygotes

Puping Liang, Yanwen Xu, Xiya Zhang, Chenhui Ding, Rui Huang, Zhen Zhang, Jie Lv, Xiaowei Xie, Yuxi Chen, Yujing Li, Ying Sun, Yaofu Bai, Zhou Songyang, Wenbin Ma, Canquan Zhou[✉], Junjiu Huang[✉]

Treatment of autosomal dominant hearing loss by *in vivo* delivery of genome editing agents

Xue Gao^{1,2,3†*}, Yong Tao^{4,5†*}, Veronica Lamas⁴, Mingqian Huang⁴, Wei-Hsi Yeh^{1,2,3,6}, Bifeng Pan⁷, Yu-Juan Hu^{4,5}, Johnny H. Hu^{1,2,3}, David B. Thompson^{1,2}, Yilai Shu^{4,8}, Yamin Li⁹, Hongyang Wang^{4,10}, Shiming Yang¹⁰, Qiaobing Xu⁹, Daniel B. Polley⁴, M. Charles Liberman⁴, Wei-Jia Kong⁵, Jeffrey R. Holt⁷, Zheng-Yi Chen^{4§} & David R. Liu^{1,2,3§}

Genome editing strategy that preferentially disrupts the mouse mutant *Tmc1*^{Bth} allele.

Targeted region of the *Tmc1*^{Bth} allele

1,235
5'- TGTCCCTCCTGGGGAAGTTCTGTCCCACCCTGT -3'
3'- ACAGGGAGGACCCCTTCAAGACAGGGTGGGACA -5'

Correction of a pathogenic gene mutation in human embryos

Hong Ma^{1*}, Nuria Marti-Gutierrez^{1*}, Sang-Wook Park^{2*}, Jun Wu^{3*}, Yeonmi Lee¹, Keiichiro Suzuki³, Amy Koski¹, Dongmei Ji¹, Tomonari Hayama¹, Riffat Ahmed¹, Hayley Darby¹, Crystal Van Dyken¹, Ying Li¹, Eunju Kang¹, A.-Reum Park², Daesik Kim⁴, Sang-Tae Kim², Jianhui Gong^{5,6,7,8}, Ying Gu^{5,6,7}, Xun Xu^{5,6,7}, David Battaglia^{1,9}, Sacha A. Krieg⁹, David M. Lee⁹, Diana H. Wu⁹, Don P. Wolf¹, Stephen B. Heitner¹⁰, Juan Carlos Izpisua Belmonte^{3§}, Paula Amato^{1,9§}, Jin-Soo Kim^{2,4§}, Sanjiv Kaul^{10§} & Shoukhrat Mitalipov^{1,10§}

Correction of the heterozygous *MYBPC3* mutation in human preimplantation embryos with precise CRISPR–Cas9-based targeting

MYBPC3, mutation causes hypertrophic cardiomyopathy. It is the commonest cause of sudden death in otherwise healthy young athletes

Autosomal dominant – effects late to develop

Human genome editing

Scientist claims first gene-edited babies

The Times November 27 2018



He Jiankui, claimed to have made the world's first gene-edited babies.

He said he had altered the DNA of twin girls called Lula and Nana to prevent them from contracting HIV.

Human genome editing

It has been widely denounced in the scientific community

Why is this a problem?

- Unnecessary (not-therapeutic)
- **Risk**
- No ethical approval
- Limited informed consent
- Playing God?
- Enhancement - transhumanism
- Eugenics
- Commodification

Modifying harmful genetic mutations through germline editing might seem an ideal outcome, but...

What are the risks?

What about consent?

What about ongoing attitudes to those who have not been 'corrected'?

What is 'normal'?

Is this the slippery slope to human enhancement?

Is there a clear difference between therapy and enhancement.

Science fiction – maybe?

But what does this say about our attitude to:

- Health and disease
- Fulfilled lives
- Dependency?
- People who suffer from disability
- People who don't match social norms
- What do we value in other people?

Is it necessary?

In many instance – **no!**

Compare with Preimplantation Genetic Diagnosis (PGD), at the 8-cell stage, followed by implantation of only the ‘healthy’ embryos, renders germ-line modification for correction of most genetic disorders unnecessary.

- autosomal recessive disease in which both parents are homozygous (e.g. cystic fibrosis, phenylketonuria)
- an autosomal dominant disease where at least one parent is homozygous (e.g. Huntington’s disease, familial adenomatous polyposis)
- Multiple defective genes



NIH reiterates ban on editing human embryo DNA

doi:10.1038/nature.2015.17452

“...the strong arguments against engaging in this activity remain. These include the serious and unquantifiable safety issues, ethical issues presented by altering the germline in a way that affects the next generation without their consent and a current lack of compelling medical applications.”

Francis Collins



Is this just “embryo healing”?

Healing, restoration, feeding the poor are a part of the Christian’s duties.

We are used to organ transplants:
Is this nothing more than a DNA transplant?



Is this 'playing God'

Treating disease and looking after the vulnerable and disadvantaged are significant commitments for Christians.

Is it part of the God-given arsenal of techniques for alleviating human suffering?

Is it lawful to do good or to do harm on the Sabbath, to save life or to kill?" Mark 3:6

We should not accept disease with a misplaced fatalism that sees everything as God's will.

Some questions – where do we stop?

Should we modify the genome of an embryo that will otherwise die of a genetic disease?

Should we modify the genome of an embryo that will have cystic fibrosis?

Should we modify the genome of an embryo that will develop Huntington's disease/breast cancer later in life?

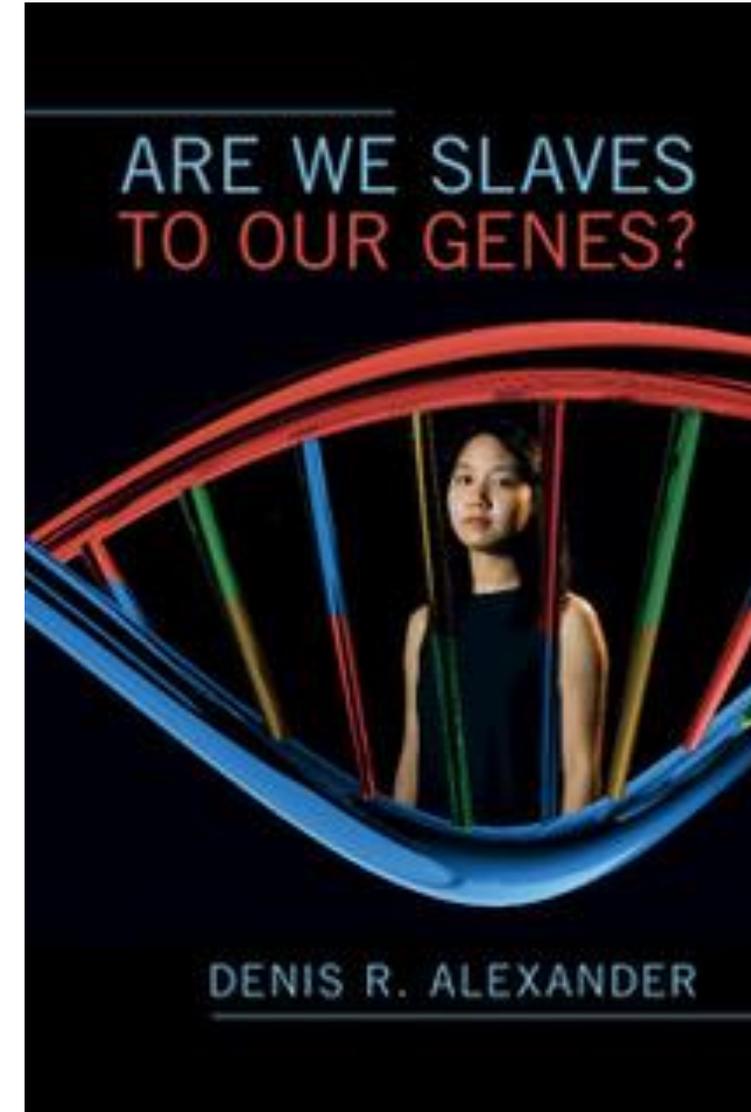
Should we modify the genome of an embryo to change their eye colour?

There are limitations to what genome editing will achieve.

Genes don't control everything about us:

They may limit what we can do, but many other factors affect our physical development and our personalities.

There are many genes that influence intelligence, but on the whole, a good education is much more important.

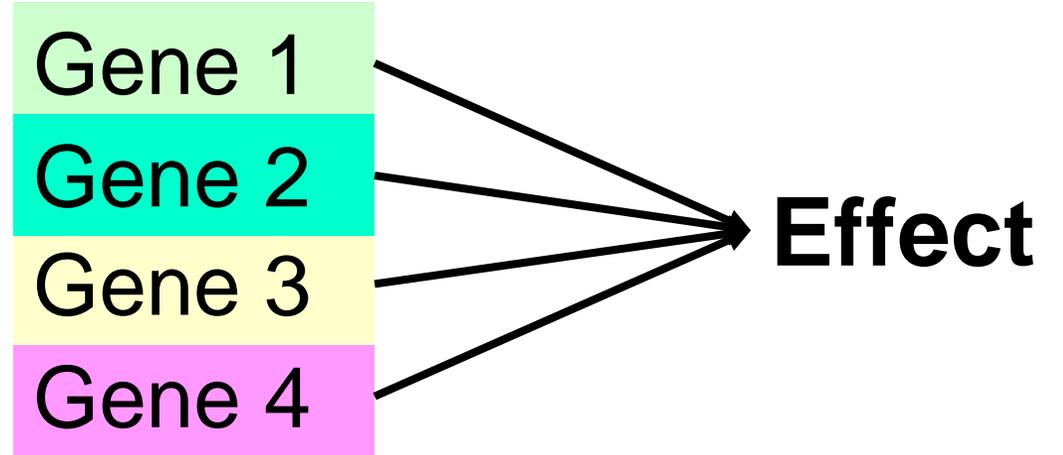


<https://www.faraday.cam.ac.uk/shop/are-we-slaves-to-our-genes/>

Multigenic traits – often there is not a “gene for...”

Enhanced IQ?

74 genetic markers comprise 0.43% of the genetic contribution to educational achievement.



A. Okbay et al. Nature <http://dx.doi.org/10.1038/nature17671>; 2016.

Type 2 diabetes - more than 36 genes.

Height – at least 697 variations at 400 locations

Mark Walker - **Genetic Virtue Project**

A project for twenty-first century humanity

Politics Life Sci. (2009) 28: 27-47. doi: 10.2990/28_2_27.

Improving morality by genetic engineering

“nearly all personality traits show *moderate heritability*....
since genes *influence* enduring behaviours, it *might be possible* to use biotechnology in a manner that would promote virtue, and thus serve as a means to improve ourselves, morally speaking..”

(italics mine)

People with disabilities are, in my view, unlikely to be queuing up for genetic modification: their priority is to combat discrimination and prejudice.

Intervention assumes that there is robust consensus about the boundaries between normal variation and disability. ...most people with disabilities report a quality of life that is equivalent to that of non-disabled people, ***and the voices of people living with illness and impairment need to be heard.***



Tom Shakespeare
University of East Anglia

**nothing
about us**

**WITHOUT
US** 

How does society include people whose impairments will not simply be edited away

Are we reinforcing an “ableist” mentality, which assumes that independence and physical functioning should be maximized, and that dependence, weakness and vulnerability are defects that are inherently bad.

Eugenics

The Roman Law of the Twelve Tables (450 BC)

‘A father shall immediately put to death a son who is a monster, or who has a form different from that of the human race’.

The practice of infanticide in the Roman Empire persisted until the advent of Christianity, which ‘marked a turning point in late antiquity in its appreciation of human life as having intrinsic value’.

Eugenics

Francis Galton: interested in 'improving human stock' to create 'better' humans.

Fearing 'degeneration', he argued that 'weakly and incapable' people should be prevented or discouraged from having children.

Galton was concerned with promoting increases in intellectual and physical vigour by encouraging marriages between those who were deemed to be physically and mentally fit.

'...a creature not energetic enough to maintain itself must die' (Spencer), claimed that indiscriminate health care would be harmful to society by allowing the weak to survive and reproduce.

Eugenics

In the US, strong and healthy families with several children were awarded eugenics prizes at local county fairs

MARRIAGES, - FIT AND UNFIT

1. PURE + PURE: -
CHILDREN NORMAL
2. ABNORMAL + ABNORMAL: -
CHILDREN ABNORMAL
3. PURE + ABNORMAL: -
CHILDREN NORMAL BUT TAINTED: *
SOME GRANDCHILDREN ABNORMAL.
4. TAINTED + ABNORMAL: -
CHILDREN $\frac{1}{2}$ NORMAL BUT TAINTED
 $\frac{1}{2}$ ABNORMAL
5. TAINTED + PURE: -
CHILDREN: $\frac{1}{2}$ PURE NORMAL
 $\frac{1}{2}$ NORMAL BUT TAINTED
6. TAINTED + TAINTED
CHILDREN: OF EVERY FOUR, 1 ABNORMAL
1 PURE NORMAL, AND 2 TAINTED.

PURE - NORMAL AND TRANSMITTING ONLY NORMAL.
TAINTED - NORMAL BUT CAN TRANSMIT ABNORMALITY.
ABNORMAL - SHOWING THE ABNORMALITY.

**HOW LONG
ARE WE AMERICANS TO
BE SO CAREFUL FOR THE
PEDIGREE OF OUR PIGS
AND CHICKENS AND
CATTLE, - AND THEN
LEAVE THE ANCESTRY
OF OUR CHILDREN
TO CHANGE, OR TO
"BLIND" SENTIMENT?**

Eugenics

Eugenicists encouraged or forced sterilizations, especially of women who were deemed unfit, including the poor, mentally insane, 'feeble-minded' and drunkards

Characteristics such as "pauperism," criminality, and "feeble-mindedness" were biologically inherited. ...training the feeble-minded and criminalistic and then letting them loose upon society and permitting them to perpetuate in their offspring these animal traits

Charles Davenport Heredity in Relation to Eugenics (1911)

Sterilization of the feeble-minded

“Three Generations of Imbeciles Are Enough”

Justice Oliver Wendell Holmes, Jr. (Buck v. Bell)

1927 Supreme court case upholding a Virginia law that authorized the state to surgically sterilize certain “mental defectives” without their consent.

It is better for all the world if, instead of waiting to execute degenerate offspring for crime or to let them starve for their imbecility, society can prevent those who are manifestly unfit from continuing their kind... Three generations of imbeciles are enough.

Eugenics

Are we in danger of side-lining people who don't fit our preconceived personal or social views

Another form of social engineering or reinforcing what is socially acceptable

'liberal' or 'consumer eugenics'

Changing her disability, “would have made us and her different in a way that we would have regretted”, he says. “That’s scary.”

Nature 530, 402–405 (25 February 2016)
doi:10.1038/530402a



Ruthie’s dad asked her whether she wished that her parents had corrected the gene responsible for her blindness before she was born. Ruthie didn’t hesitate before answering - no. Would she ever consider editing the genes of her own future children to help them to see? Again, Ruthie didn’t blink - no.

Is it wrong to select a deaf embryo?

<http://news.bbc.co.uk/1/hi/health/7287508.stm>

Deaf parents who want a deaf child:

Some deaf activists insist that they do not have a disability

“Deafness isn’t a disability—it’s a culture”



What seems like disease and weakness to some is a strength to others.

Through his thorn in the flesh the apostle Paul learned that God’s “power is made perfect in weakness”.

What is “normal”

Human diversity is part of what it takes to make society

Many people acknowledge the free, unmerited nature of life as a gift.

In speaking of an athlete’s or a musician’s “gift”, we acknowledge that there is a fundamentally contingent factor in play.

“excellence consists at least partly in the display of natural talents and gifts that are no doing of the athlete who possesses them. This is an uncomfortable fact for democratic societies.”

Human life is a gift, not an achievement

Human genetic enhancement?

Re-inventing ourselves

Enhancement : ‘improvement’ of human performance, appearance or behaviour through genetic science, medicine, and technology.

Enhancement or therapy?

Is there a clear distinction?

The World Health Organisation defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”.

Compare with other forms of enhancement:

Nutritional

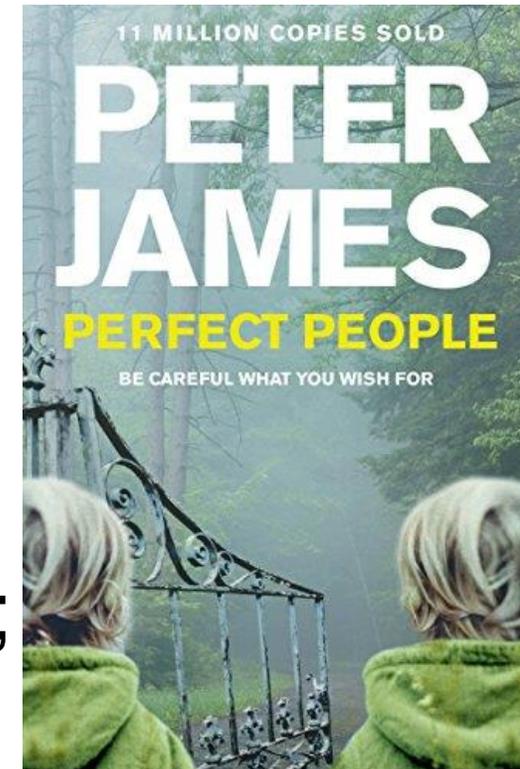
Pharmacological

Non therapeutic gene editing ENHANCEMENTS

Some people are born with inherent advantages over others;
Should we try to level the playing field?

All parents wish the best for their children
Parents could “upgrade” the athletic prowess of
their children, enhancing their opportunity giving
equal opportunity to everyone.

Not introducing new genes, but ‘shuffling the pack’;
good combination of natural genes.



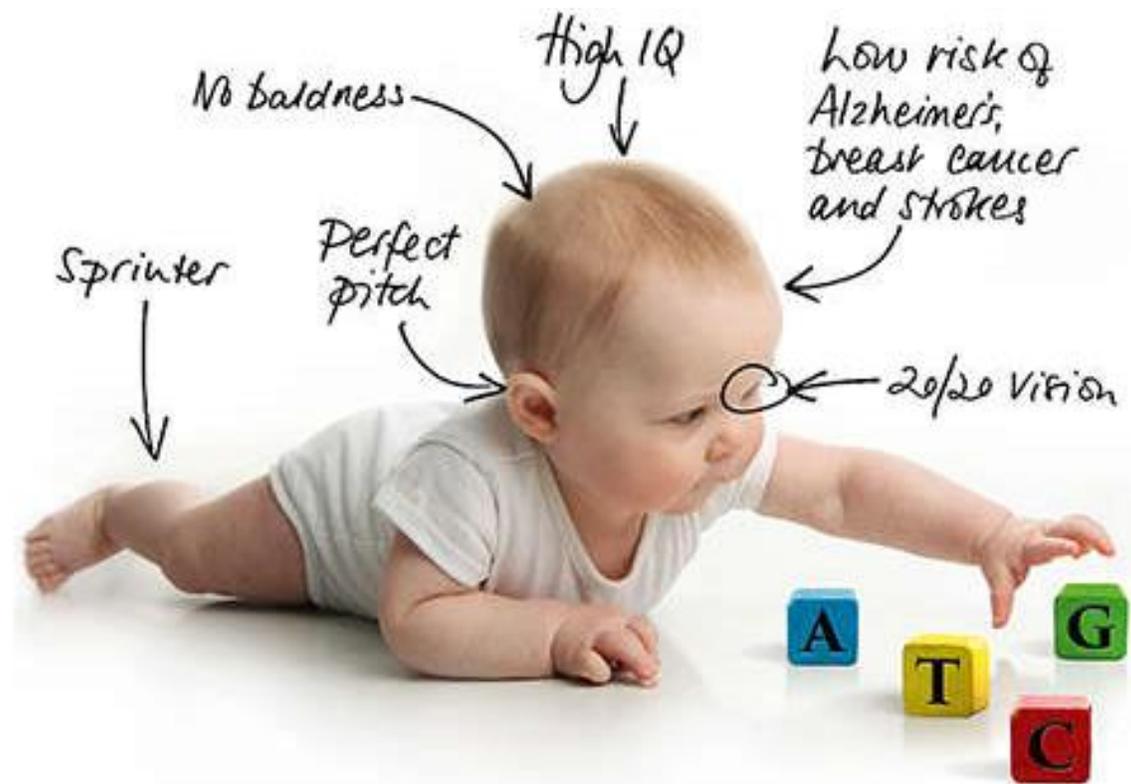
'Don't edit the human germ line'

Lanphier *et al. Nature* (2015) 519, 410

Slippery slope

Even unambiguously therapeutic interventions could start us down a path towards non-therapeutic genetic enhancement.

- Intelligence
- 20/20 vision
- Athleticism
- Musical ability
- Beauty



Creating the perfect team?

An unnamed Premier League football club has DNA tested its players to work who is more injury-prone.

The study profiled more than 100 genetic mutations linked to an increased chance of injuries such as ruptured tendons.

Mutations in a collagen gene COL5A1 lead to the tendon being more loosely connected, making it more prone to injury.

It may be really unfair to have a child who likes football, who may be told he will never make it because he has the wrong set of genes,'



<http://www.dailymail.co.uk/news/article-2049783/Scientist-claims-football-club-DNA-tested-players-injury-prone.html#ixzz1ayqGuPSE>

Can Genetics Predict Sports Injury? The Association of the Genes *GDF5*, *AMPD1*, *COL5A1* and *IGF2* on Soccer Player Injury Occurrence

Sports (Basel). 2018 Mar; 6(1): 21.

Kiah McCabe and Christopher Collins

Abstract

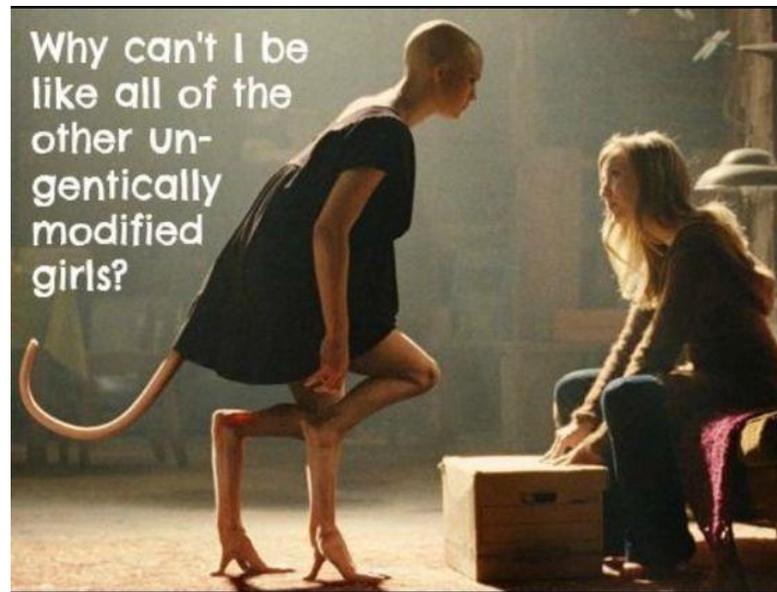
Genetics plays an integral role in athletic performance and is increasingly becoming recognised as an important risk factor for injury. Ankle and knee injuries are the most common injuries sustained by soccer players. Often these injuries result in players missing training and matches, which can incur significant costs to clubs. This study aimed to identify genotypes associated with ankle and knee injuries in soccer players and how these impacted the number of matches played. 289 soccer players, including 46 professional, 98 semi-professional and 145 amateur players, were genetically tested. Genotypes found to be associated with injury included the TT (nucleobase) genotype of the *GDF5* gene, TT and CT (nucleobase) genotypes of *AMPD1* gene, TT genotype of *COL5A1* and GG (nucleobase) genotype of *IGF2* gene. These genes were also associated with a decrease in the number of matches played.

Commodification

The application of germline manipulation would change our view of the value of human life. If genomes are being altered to suit parents' preferences, do children become more like commodities than precious gifts?

Francis Collins

Are we in danger of 'breeding' humans for mathematical, musical or athletic ability' What if you had been modified/commodified?



‘Begetting’ or ‘making’

‘Begetting’ – a personal, non-manipulative relationship, with an element of mystery in the child’s future

Contrasted with technological ‘making’ reducing children to products of our own clever creating.

When parents pursue their personal ambitions with technological interventions, their relationship with the child is compromised.

Genetic one-upmanship?

Parents might keep up with the latest genetic fashion.

Genetic obsolescence

Genetic enhancement to Life 2.0 may seem inadequate as soon as Life 3.0 becomes available.

Today's enhanced child may be seen as 'yesterday's child' in only a matter of years.



Eugenics and consumer culture:

It is not such a great a leap from ‘you *can* have a genetically improved baby’ to ‘you *must* have a genetically improved baby’.

Renegade scientists and totalitarian loonies are not the folks most likely to abuse genetic engineering... You and I are, not because we are bad but because we want to do good ... parents understandably want to give their kids every advantage. ... The most likely way for eugenics to enter into our lives is through the front door as nervous parents – awash in advertising, marketing and hype – struggle to ensure that their little bundle of joy is not left behind’.

Arthur Caplan, *Time* magazine

I am not willing to write this work off as an attempt at “playing God.” I think that we each play God every time we decide we would rather do things our way ... When we put ourselves in charge of our health, our time and our resources, ... Instead, this is an example of using the technologies ... in hope of reducing suffering. I can see redemption in this work.

Dr Clayton Carlson assistant professor of biology at Trinity Christian College in Palos Heights, Ill.

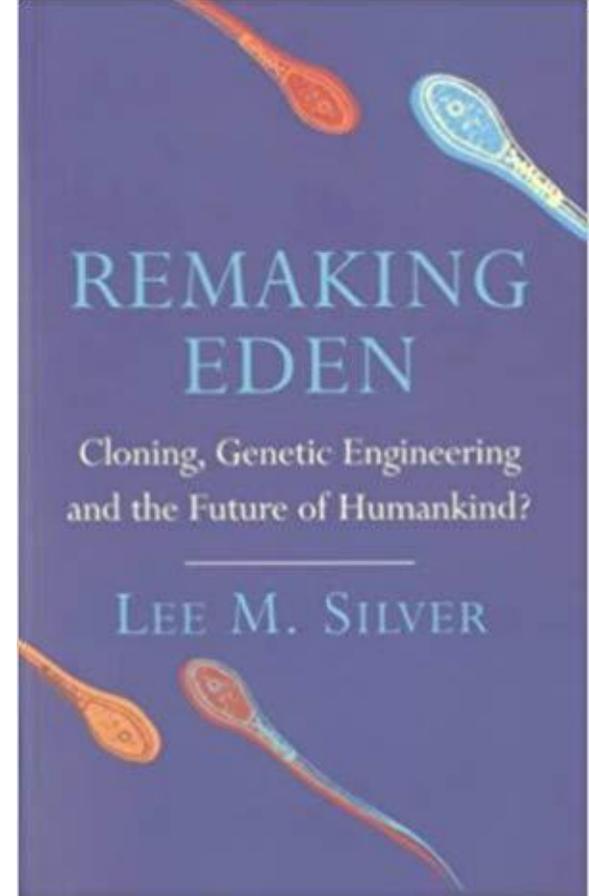
<http://thinkchristian.reframemedia.com/has-a-line-been-crossed-in-regard-to-human-dna>

Will the gene-rich become a separate species?

Technoselfishness: Faster, brighter, stronger does not mean better.

“Many researchers think that a high IQ goes hand in hand with high moral values.” ...[T]his correlation “is of course, absolute nonsense.”
(Stephen Lock, BMJ)

Will we have made better people or enhanced humans?



Man's power over Nature turns out to be a power exercised by some men over other men with Nature as its instrument”

CS Lewis – Abolition of Man

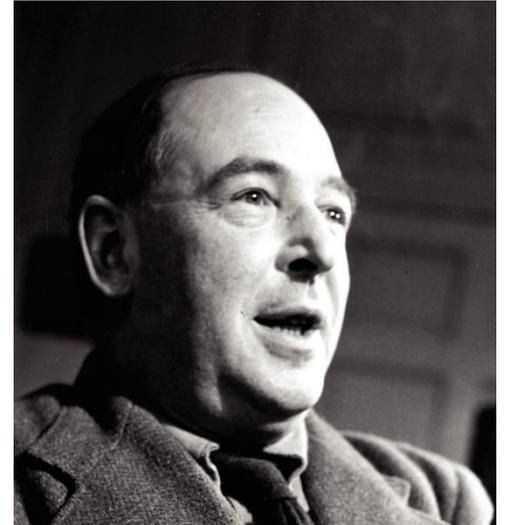


Image of God

Humanity is created in the 'image and likeness' of God. *Gen. 1:26-28.*



Genetically we are 98% similar to chimpanzees –
This does not make them 98% in the image of God!

Image of God

Creativity is part of the image of God, we are God's co-creators

Genesis 1-3 humans are required to bring meaning (*name*), tend (*abad*) and care for (*shamar*) creation. We have a huge scope for action, but there will also be boundaries to these responsibilities.

ALL people are in God's image (not just the special ones)

It is delegated to all humanity.

Irrespective of their ability to contribute to society.

Each one is of worth – loved by the creator

(contrary to first century infanticide).

We are God's image – but we are not God

Image of God

It concerns the **WHOLE** person

Genomic variation, environmental influences, and personal choice all play a part in human development- and it is the whole person who responds to God.

Genetic variation is another indicator of our individual human uniqueness.

Image of God

All human persons have worth and dignity, regardless of what they can or cannot do.

Humans have value because of what they are, not because of what they can do.

Image of God

Evolution, the End of Human Uniqueness, and the Election of the *Imago Dei*

Joshua M Moritz, *Theology and Science* (2011) 9, 307-339

Instead of grounding the image of God in some human characteristic – *imago Dei* is best understood in light of the Hebrew theological framework of historical election.

It relies on God's **grace**, and the status bestowed on the whole of humankind as a community

“Prediction: my grandchildren will be embryo-screened, germline-edited. Won’t ‘change what it means to be human’. It’ll be like vaccination.” *Dan MacArthur, Harvard University*

Sandy Sufian, (historian of medicine and disability)

University of Illinois, agrees that CRISPR has the potential to become widely adopted, because

1. it would save money that would otherwise be spent caring for disabled people
2. because of people’s fear of disability.

But she questions the idea that eliminating such conditions will necessarily improve human life. Sufian has cystic fibrosis. Yet given the option to edit cystic fibrosis out of her bloodline, Sufian wouldn’t do it. “There are some great things that come from having a genetic illness,” she says.

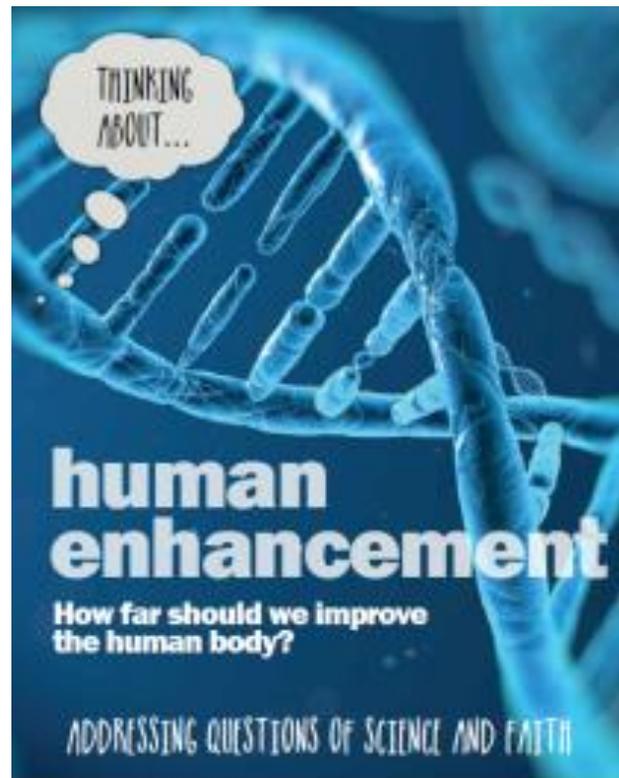
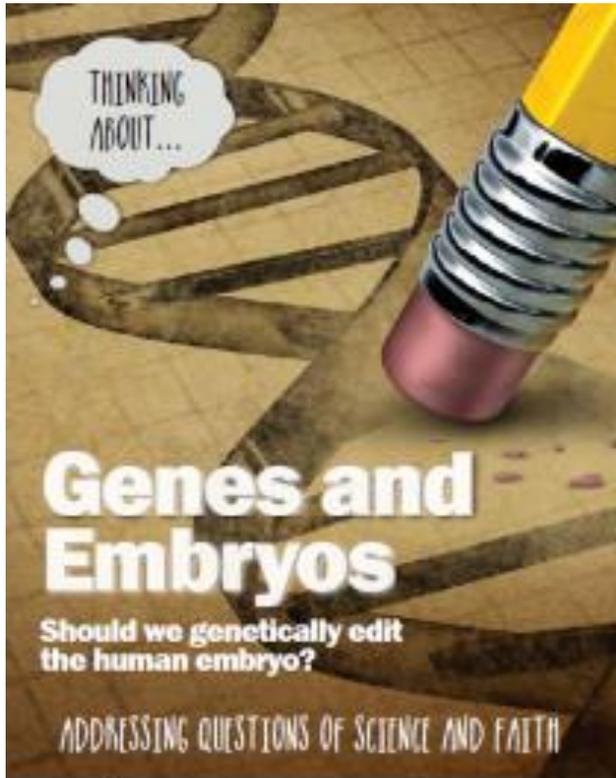
For you created my inmost being;
you knit me together in my
mother's womb.

I praise you because I am fearfully
and wonderfully made;
your works are wonderful, I know
that full well.

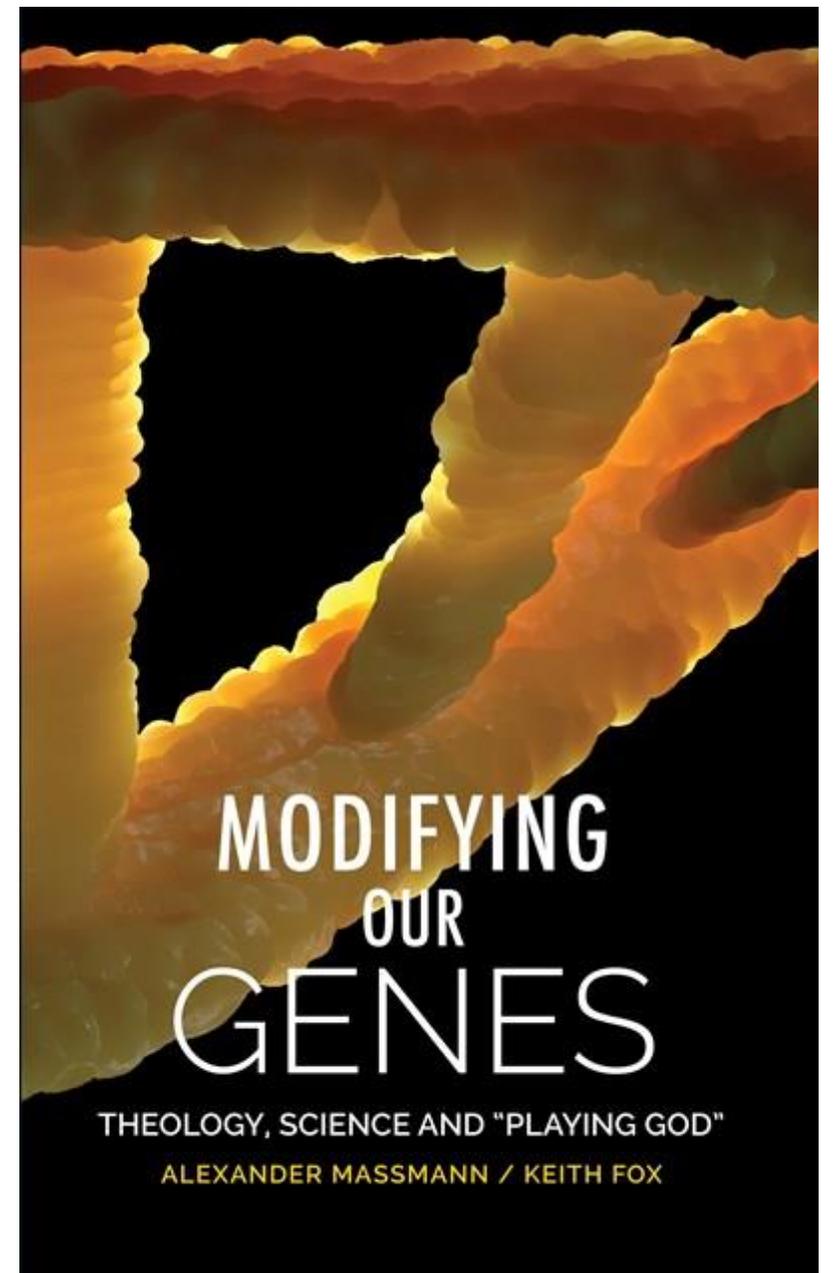
My frame was not hidden from you
when I was made in the secret
place, when I was woven together in
the depths of the earth.

Psalm 139:13-16





<https://www.cis.org.uk/resources/thinking/>



<https://www.faraday.cam.ac.uk/shop/modifying-our-genes/>