

# REWRITING HUMANITY: REFLECTIONS ON THE POSSIBILITY AND DESIRABILITY OF GENETIC ENGINEERING

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I'm a science fiction writer. My only other qualification for talking about genetic engineering is that I have a zoology degree from Glasgow University. Unfortunately, when I was studying for it, in the early 1970s, genetic engineering really was science fiction. Even more unfortunately for my qualifications to talk about this, the effect of science fiction on public discussion of genetic engineering has been rather unhelpful. From *Frankenstein* to those 1950s horror movies which ended with a priest saying, above the smouldering ruins of a laboratory, "There are things which Man was not meant to know", SF and its mutant offspring have lurched and stumbled through popular consciousness, leaving a trail of broken glassware and misconception, suspicion and superstition about science behind them.

What I'd like to do is look at three questions about the genetic engineering of human beings:

- 1 — Can we do it?
- 2 — If we can, should we do it?
- 3 — If we do it, what consequences can we expect?

## IT CAN BE DONE

OK, first, can we do it? It's traditional at occasions like this for authors to plug a book, and the book I want to plug is not my one of my own but Matt Ridley's *Genome* (which is a lucid, up-to-date and readable explanation of what the human genome actually is and how we might be able to make changes to it. The answer, as far as I can see from this book and a lay person's reading of *New Scientist* and so forth, is yes, we can.

As Ridley explains (pp. 243-257) retroviruses can have genes spliced into them, and some of their own genes edited out. The resulting modified retrovirus can then be used to infect a patient, and it proceeds to insert the new gene in the patient's cells. This has actually been used for gene therapy for rare and obscure immune deficiency disorders.

But this — somatic gene therapy — only modifies the body of one individual. It doesn't affect the germ cells, and produces no inherited changes. Changes that could be inherited are not only possible but easier — instead of changing billions of cells, you need only change one or a few, in the early embryo. You can literally stick the genes in with a pipette. Transgenic mice already exist, and are used in research.

So in principle, yes, it can be done. We could have transgenic people if we wanted to. Doing this to change anything other than conditions where one or a few genes are missing or have gone wrong would be complicated, but we can throw computing power at complexity. Computing power halves in price every eighteen months or so, and will go on doing so for quite some time.

Of course at the moment it seems we don't want to. Germline gene therapy on human beings is effectively banned, and nobody in the business is proposing it.

## THE HUMAN GENOME IS NOT SACRED

Which brings me to the second question, which is: given that we can do it, should we do it?

There are two kinds of possible objections: ethical and prudential.

Is it ethical to pass on genetic changes to future individuals, without their choice? Well, we already do, unintentionally. If it's not unethical to have children who inherit your own existing genes for susceptibility to heart disease or cancer or whatever, it can hardly be unethical to pass on modified genes which confer a *reduced* susceptibility. Any change that isn't socially understood as an impairment or, let's say, an embarrassment — anything that is an actual improvement — would seem on the face of it to be well worth inheriting.

But is tampering with the human genome in itself ethically unacceptable?

I think we're in a rather unusual situation here in that we have a new science and technology to which the major traditional religions and philosophies in the advanced countries have no major moral objection in principle. Some Christians, particularly but of course not only Catholics, have moral objections to destroying or discarding human embryos in research. But suppose there was a technical way around that, that human genetic engineering could be done without damaging or destroying human embryos. If that were the case, would Christianity, Judaism, Islam or the secular humanism which for so many of us is a default option have any objection to human genetic engineering as such?

As far as I can see, the answer is no, they wouldn't. Human life may be sacred but the human genome is not. Whatever the image of God may be, it isn't a long skein of DNA molecules. It isn't chromosomes and genes, and most particularly it is not the genes for cancer, Alzheimer's, Tay-Sachs and cystic fibrosis. The human genome is a part of nature, however it came into existence. I think the evidence is overwhelming that it came into existence by natural selection, and many religious believers of course would agree. But, whether they take Genesis literally or symbolically, the religions which include Genesis among their scriptures acknowledge that we have a duty — indeed, a mission from God — to change nature for human benefit. No teacher of these religions

## Scientific Notes No. 13



ISSN 0267-7067 ISBN 1 85637 514 5



An occasional publication of the Libertarian Alliance,  
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This article is based on notes and afterthoughts from a talk, 'Rewriting Humanity', delivered on 15 November 2000 at the Crichton Campus of the University of Glasgow as part of their course on Issues in Contemporary Society, details of which can be found at: <http://www.cc.gla.ac.uk/courses/ics.htm>

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should really say, of any question about the natural world, that "There are some things that Man was not meant to know."

### "THE SACRED DEPTHS OF NATURE"

But of course there are other religions and philosophies in our societies, whose adherents might strongly object to that view. Deep ecology, paganism, some forms of pantheism all regard nature as sacred, and might regard the genome itself as part of "the sacred depths of nature" — to use the title of a book by Ursula Goodenough which I haven't read. She's a biologist, and I don't know what her views are on the subject of genetic engineering. But I think the phrase itself captures an attitude very well, and some expressions of that attitude are indeed quite opposed to tampering with the genome.

So we have this interesting situation where the established traditional religions may be more open to human genetic engineering than some new — or revitalised old — religions and philosophies, and where these new views are a minority but a minority which is growing in influence. In fact their influence meshes well with much more widespread and prudential worries about the whole thing — not just genetic engineering, but even the mapping of the human genome.

How could mere knowledge be harmful? Here's one way — knowing in sufficient detail what genes individual people carry could make these individuals uninsurable — a 'genetic underclass'. With some genes — like those for Huntington's chorea — the time of onset can be predicted almost to the year. Less spectacularly, if genetic screening became cheap and easy for lots of genes predicting various illnesses, insurance companies could start asking if you'd ever been screened, or asking for the results. Their interest in tailoring the policy as precisely as possible to your predicted risks — a policy as unique as yourself! as they might advertise it — would conflict with your interest in pooling your risks with those of others.

Another area of justifiable public concern is the notion of patenting gene sequences and claiming intellectual property in genes, which is part of the wider problem of the business interests which are driving a large part of the whole endeavour. However, both the insurance and the intellectual property problems are of a kind which is eminently fixable by passing appropriate laws, or tweaking existing laws.

### JUSTIFIABLE CONCERNS

What's much less easily dealt with are unintended consequences, and here we have two levels of possible concern. One is that because of the BSE disaster, people in Britain are inclined to be suspicious of assurances from scientists and governments and agro-industrial companies. So we have a situation where genetically modified crops that have been used on a huge scale in America get torn up and trampled by protesters here, to the bemusement of Americans.

But even without that arguably irrational fear, there would still be justifiable concerns because there *will* be unintended consequences which no amount of computing power can predict. To justify this I can only handwave about chaos theory, complexity theory and so on, but I'm sure the point is fairly evident: small changes in complex systems can have large and unpredictable effects. Besides that, there are lots of things we still don't understand. This is all very new. It's only in the last hundred and fifty years that we've known about natural selection; only a century since Mendelian genetics was rediscovered; half a century since the structure and function of DNA was understood; a decade or so of genetic engineering; and the first rough draft of the human genome was published this year.

However, I think human genetic engineering will be done, if only because somebody, somewhere, will try it regardless. Better it were done in the open, in free societies and not in secret laboratories.

### AN AWARENESS THAT TRADE IS BETTER THAN CONQUEST

Which brings me to my final question, which is what consequences we can expect.

The most immediate consequence of mapping the human genome will be better — and better targeted — medical treatments, as explained in a recent issue of *New Scientist* (number 2263, 4 November 2000). More long-term, somatic gene therapy will be applied to a wider range of illnesses and conditions. Somatic gene therapy will remain necessary even if germline gene therapy ever becomes universal, because genes will always mutate.

Suppose that human genetic engineering, in the sense of heritable changes to the genome, became widely practised. Suppose, for example, that suddenly there's a generation of Japanese schoolchildren with IQs of 200. Or suppose rich people could suddenly afford to make their children, and all their descendants, highly intelligent. Would this be a problem for the rest of us?

Not necessarily. It might seem unfair, but the better-off already transmit many advantages to their children — in social connections, in education, and in inherited wealth. And this is not necessarily unjust, or to the disadvantage of anyone else.

People of ordinary intelligence can *benefit* from the existence and activities of people of superior intelligence or ability, if their relationship with these people is peaceful, productive, and profitable. And such relationships can always potentially exist.

Take, for example, an all-round genius called Victor, and an ordinary bloke called Igor. Victor can do *everything* better than Igor. He can wash his laboratory glassware twice as fast as Igor can. But, because the time Victor spends washing the glassware would be much more profitably spent doing something else, such as designing experiments and deciding which green, bubbling chemicals he's going to put in the glassware today, it pays Victor to pay Igor to wash his glassware. And if Igor gets better pay as a bottle-washer up at the castle than as a labourer down in the village, then they both benefit.

A lot of our worries about a 'master race' and so on quite understandably come from the history of Nazism. But the ideas on politics and economics that the Nazis shared with a lot of other people in their time were as crude and mistaken as their understanding of genetics. Which is to say, they were distorted by envy, greed, hatred, pseudo-science and superstition. These are still with us, of course, but they are a lot less intellectually and socially respectable than they were in the 1930s and 1940s. I think there's more of an awareness now that trade is more profitable in the long run than conquest and enslavement.

### THE TECHNOLOGY IS NEW BUT THE ARGUMENTS ARE NOT

I suppose what I'm saying is that the genetic revolution doesn't raise any new ethical issues, it just sharpens our awareness of old ones.

For example, suppose it was possible to engineer a retrovirus to be highly infectious and which carried a permanent, inheritable fix for, say, susceptibility to heart disease. Would it be wrong to release it on the world, thus in effect giving people a preventive medicine whether they wanted it or not? We don't ask people's permission to drop emergency food aid to them, why should we ask their permission to unilaterally improve their life expectancy?

Is it the genetic engineering aspect of this suggestion that makes us uneasy? Well, suppose we could do the same by releasing a gas into the atmosphere? Would this be any different from releasing a benign retrovirus? Or — moving in the other direction on the same slippery slope — how about putting a mineral in the drinking-water supply that reduces the incidence of dental caries?

The genetic technology is new, but the ethical and political principles by which we can decide how to use it aren't. They'll continue to be argued about, and that's one aspect of human nature which genetic engineering is unlikely to change.