The Ethics of Genetic Research on Intelligence

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ABSTRACT

Should research on the possible genetic components of human intelligence be carried out? I first try to provide some general guidelines as to whether any particular piece of research should be undertaken and then consider the specific example of the ethics of genetic research on intelligence. The history of the debate on intelligence does not make one very optimistic that the fruits of such research would be used wisely. However, there are indications that people's understanding of the nature of inheritance may be improving and it could be that such research might have significant benefits. It is worth remembering than the condition phenylketonuria, a genetic disease in any useful sense of the term, and one that leads to mental retardation (i.e. very low intelligence), is now wholly preventable, and indeed very largely prevented, through environmental intervention.

The Ethics of Genetic Research on Intelligence

Should we carry out or allow to be carried out research that aims to determine the genetic underpinnings, if any, of human intelligence? The question is both controversial and timely. It is controversial not only because there are arguments both for and against such a research programme but also because there are many who, for a number of reasons which will be discussed further below, deny the validity or appropriateness of the question. It is timely because, as is widely known, the rapid progress made on the Human Genome Project and other fronts of molecular biology means that the possibility of such a research programme is already with us.[1] Indeed, it can be argued that research in this area is already beginning, albeit in a somewhat covert fashion.

The main aim of this paper is not to provide a definitive answer to the question of whether research on the genetic basis of intelligence (understood throughout this paper as referring specifically to human - rather than artificial or animal non-human - intelligence) should be forbidden, permitted or advocated. Rather it is to attempt to spell out the various relevant considerations that should be taken into account before decisions are made.

I begin in Section I by noting that in general there are ethical arguments for and against doing any particular piece of research. In Section II I look at what ethical arguments about research on the possibility of a genetic basis to human sexual orientation can tell us about the ethics of equivalent research on intelligence. Section III presents, as an analogy, a sort of thought experiment which consists of a set of arguments against carrying out research into short-sightedness. Section IV describes specific arguments against carrying out research on the genetics of intelligence. Section V describes specific arguments in favour of such research. Finally, Section VI tentatively presents a conclusion.

IA. GENERAL ETHICAL ARGUMENTS FOR DOING A PARTICULAR PIECE OF RESEARCH

I can conceive of four main general ethical reasons for allowing a particular piece of research to go ahead. They overlap to some extent but it may be useful to consider them separately. These general arguments, though obviously not their specific formulations, are meant to hold whatever the actual proposed piece of research is; for example, it might be research into the safety of bridges, the structure of the electron or the mating habits of a Peruvian beetle.

Arguments against banning things

One argument for allowing a particular piece of research is the standard one that in a (relatively/partial) liberal democracy one needs strong arguments before one bans things. One of

the lessons of history is that in earlier times practices have been banned which now most of us consider appropriate. Many of these are to do with gender or sex - for instance, the admission of women to universities and the de-criminalisation of same-sex relationships - but not all. For example, we now allow non-property owning people to vote at elections. In those cases where countries have decided to ban practices permitted in previous time, e.g. slavery and torture, this is usually because the practices are now widely considered intrinsically unacceptable for reasons to do with respect of persons.

In many societies nowadays, the major reasons for banning things are on the grounds that the activity would or might harm others - e.g. various laws on the control of gun ownership - or on the grounds of distributive justice - e.g. laws about having to pay taxes. Indeed, it is noteworthy just how much we allow people to do even when we know it would, in at least some senses, be better for them if they didn't - e.g. it would be better for most people, from a narrow, physical health perspective, if they didn't smoke cigarettes. We allow adults to smoke precisely because we choose / prefer to live in societies where, roughly speaking, the granting of autonomy is felt to be a higher good than the imposition of beneficence.

Autonomy of scientists and funders

A particular form of the 'Arguments against banning things' reason is that scientists and funders, along with other individuals and institutions, should have autonomy. This argument is not to assume naively that scientists or funders exist independently of societies, free to choose without constraints their topics for study. Indeed, it may be that one of the strongest arguments for encouraging scientists (and funders) to believe that they are acting autonomously is simply the consequentialist one that many people, including, I suspect, academics such as research scientists and moral philosophers, produce their best work when they believe that they are doing what they want to do.

Intrinsic quest for knowledge

My personal experience is that quite a few scientists when asked why it would be right to carry out a particular piece of research simply reply along the lines that is would be 'interesting' or 'it hasn't been done before'. Now such answers do not fall entirely under the 'Intrinsic quest for knowledge' heading. After all, the scientists in question may, consciously or not, be thinking that a new area for study may make it easier to get funding, may lead to publications in prestigious journals or may increase their chances of receiving adulation / admiration either from their peers or from society in general (in the UK we still give our best scientists, once they have done their finest work, knighthoods, send them to The House of Lords or suchlike).

Nevertheless, despite the dangers in uncritically accepting the 'Intrinsic quest for knowledge' argument, it may have some validity as a description of the motivation behind certain pieces of research. For whatever reasons, a significant number of scientists believe they have almost a moral duty to investigate new areas for study - the 'Because it's there' phenomenon.[2]

This is not, of course, to accept the normative validity of the 'Because it's there' argument as a reason for carrying out a particular piece of research. Indeed, under the extreme (used descriptively rather than necessarily pejoratively) viewpoint advocated by Peter Unger, the great majority of Western adults (with the possible exception, apparently, of well-established moral philosophers of about Unger's age or older) have a moral obligation (certainly, once they have read his book) to abandon their current professions and channel all their efforts into the relief of world poverty by diverting funds (whether by hard work, theft or almost any other means) from the countries in which they live to so-called under-developed ones.[3]

Usefulness of information/ideas gained

For most people, including the general public, by far the most significant reason for carrying out a piece of research is that the information gained or ideas generated with be of worth, helping to increase the sum total of human happiness or produce some other desirable benefits. This is most clearly the case when we are talking about research in the applied sciences, such as medicine, agriculture and engineering.

IB. GENERAL ETHICAL ARGUMENTS AGAINST DOING A PARTICULAR PIECE OF RESEARCH

Four main, overlapping arguments against doing a particular piece of research can be envisaged.

It would be wrong in itself even to want to do the research

We can imagine pieces of research where most (or, at any rate, a significant proportion of) people would consider it wrong for someone even to want to do the research. An instance would be research on more effective ways of torturing people. This is not to say that arguments cannot be advanced to permit or even require such research (a standard example, rarely faced in reality but constantly occupying the thoughts of some moral philosophers, would be when the health of millions of people depends on one individual being 'persuaded' to reveal the location of a single missile site). It is enough for us to admit the existence of reputable ethical arguments (Kantian ones, most obviously) that would preclude such research even if not everyone accepts the validity of those admittedly reputable ethical arguments.

The process of the research itself would have unacceptable consequences

We can imagine cases where carrying out the research programme itself would be wrong because of the direct consequences for those involved in the research. An example is provided by Stanley Milgram's classic work on obedience.[4] Despite the undoubted worth of the study, which fulfils all four of the criteria in Section 1A above, the codes of many psychological societies would nowadays preclude such research from being undertaken on the grounds that the deception it requires of the participants is excessive. A second example may be provided by research that is still carried out for the intended benefit of soldiers shot in battle. To improve the operating skills of army surgeons, pigs are shot and then operated on by the surgeons for practice.

The net consequences of the results of the research would be harmful

One can envisage research programmes that we might conclude should not be carried out because they would, on balance, lead to undesired consequences. A possible example (though one I would find it difficult to defend in detail if hard pressed - I can only hope that its presentation at least clarifies the point I wish to make) might be publicly-funded research on new ways of breaking into locked cars. While such research might well help produce new car protection systems that would make it more difficult for the cars to be broken into / stolen, these benefits might be outweighed by the 'educational' effects of the research for inexperienced or inept car thieves. (Of course, car companies undertake such research privately and guard their findings to a greater extent than a publicly-funded body might be able to.)

The money could be spent better elsewhere

A final and very significant argument against a proposed piece of research is simply that, whatever its merits, given that research funds are limited, the money could be spent better elsewhere. This argument has an undoubted validity and academics in general, not just research scientists, are all too familiar with it. Indeed, a large part of the skill of awarding research grants is to know where to target one's funding so that there is a good chance of the research's aims being realised (obviously a probabilistically-based utilitarian argument could firm up what is meant here by 'good').

II. WHAT CAN RESEARCH ON THE POSSIBILITY OF A GENETIC BASIS TO HUMAN SEXUAL ORIENTATION TELL US ABOUT THE ETHICS OF EQUIVALENT RESEARCH ON INTELLIGENCE?

Udo Schuklenk has argued with his co-authors against genetic research on sexual orientation.[5] His arguments are worth examining in the context of this paper as there are significant parallels between genetic research on sexual orientation and genetic research on intelligence. In both cases the debate is timely and in both cases there have been arguments advanced, often with considerable passion, on both sides.

Schuklenk advances a number of reasons as to why research into the genetics of sexual orientation is wrong. For a start he points out that lesbians, gay men and bisexuals are still subject to widespread discrimination and social disapprobation. There are large numbers of people, including some who research in this area, who believe that homosexuality is second-best, a disease or evil. Given this, their research is likely to be biased and to strengthen and perpetuate homophobia. Indeed, Schuklenk questions whether researchers on sexual orientation can ever conduct their work in a value-neutral manner given that it is the focus of widespread and intense interest.

Then Schuklenk argues, as have others, that such research might end up leading to prenatal tests that would be used to abort fetuses that seemed to be 'homosexually predisposed'. Schuklenk points out that such tests might be developed and enjoy widespread use and apparent success even if invalid (in a descriptive rather than normative sense). For example, if a lesbian knew that her parents had used such a test which had erroneously proved 'negative', so allowing her to be born, she might well be more likely to hide her sexual orientation from them. As a result the test would seem to work. (I hope it is not too flippant here to mention the story of the man in South England who each Saturday went round the edge of his property scattering small pieces of garlic. On finally being asked by his neighbour 'Why?' he replied 'To keep the tigers away'. His neighbour rejoined 'But there are no tigers here!', to which he replied 'You see. It works!'.)

Schuklenk goes on to demolish one argument in favour of genetic research on sexual orientation, namely the argument that such research can successfully counter claims that homosexuality is abnormal or unnatural through revealing so called gay genes. There are a number of things that are wrong with this argument but perhaps the most basic is that, as is very widely agreed nowadays among moral philosophers, none of the ways in which normality is defined validly direct us in the making of moral judgements.

Before leaving Schuklenk's arguments, it is worth noting why they do not apply to genetic research on phenylketonuria. Phenylketonuria is a hereditary disease caused by an autosomal (i.e. non-sex-linked) recessive allele: the liver fails to produce the enzyme phenylalanine hydroxylase, so that the amino acid phenylalanine accumulates in the bloodstream instead of being converted to another amino acid, tyrosine.[6] This causes severe damage to the brain of the developing child leading to mental retardation. Until a few decades ago, adults with phenylketonuria were frequently institutionalised. Nowadays, though, in a large number of countries all new-born babies are tested by the Guthrie test to see if they have raised levels of phenylalanine in their blood. If they do, they are put on a diet that is low in phenylalanine and

high in tyrosine. This allows normal brain development. Although these diets are quite expensive, and extremely boring for those who have to live on them throughout their childhood, they do allow normal brain development to take place.

The reasons why Schuklenk's arguments do not apply to research on phenylketonuria are, first, that it, unlike homosexuality, is manifestly and unambiguously a disease and, secondly, that it is treatable for individuals with the condition, enabling them to lead far richer and more worthwhile lives than would otherwise have been the case. (To say this, though, is to use hindsight. At the time of the original research, one could not have been sure that the condition would be treatable.)

III. THE ETHICS OF RESEARCH INTO SHORT-SIGHTEDNESS

The above considerations of sexual orientation and phenylketonuria introduce, by analogy, some of the factors relevant to the question whether equivalent research on intelligence would be a good thing. Here I would like, somewhat tongue in cheek, though with the hope of making a valid point, to imagine that we live in a society just like the one in which we do live except for one feature. And that is that people are only just beginning to talk about the notion of 'short-sightedness'. Of course, no formal tests of short-sightedness have yet been agreed upon and no one has spectacles or any other way of correcting short-sightedness.

I think it is easy to imagine the arguments, in such an hypothesised society, for undertaking research into short-sightedness: its causes, its manifestations and so on. Here I would like to spell out the arguments one could imagine that might be put to counter the notion that such research should be undertaken. I hope the parallels with research on intelligence are sufficiently clear for it not to be necessary for them to be spelt out.

For a start, we can imagine certain psychologists pointing out the methodological problems that exist in attempting to measure short-sightedness. After all, we should bear in mind that good eyesight in a laboratory or clinical setting cannot be presumed to be the same as good eyesight in 'the real world' where life is far more complicated.

Then there are philosophers quick to remind us that there are problems in defining short-sightedness. In particular, we should bear in mind that what the eye sees is not the same as what the brain perceives.

The pragmatists will ask what the point of the research is. After all, even if short-sightedness does exist and even if it can, albeit somewhat crudely, be measured, we can't do anything about the fact that some people are short-sighted.

Then there are those, mainly to be found among those whose eyesight is rather good, who maintain that variation in short-sightedness is part of the richness of humanity.

Others will assert that we already know that short-sightedness is due to children reading too much at too early an age, pointing out that convincing cross-cultural comparisons establish this beyond doubt.

Then government ministers and those in charge of hospital budgets will appear on national television pronouncing that we won't be able to afford treatment of short-sightedness for everyone.

Finally, well meaning intellectuals will form pressure groups with poorly designed web sites arguing that the diagnosis of short-sightedness will lead to certain people being stigmatised. It may, for example, preclude such people from entering certain professions or even lead, shock horror, to ordinary citizens having their driving licences taken away. This last fear should be enough to banish for decades the possibility of the research ever being funded.

IV. SPECIFIC ARGUMENTS AGAINST CARRYING OUT RESEARCH ON THE GENETICS OF INTELLIGENCE

There are a number of specific arguments against carrying out research on the genetics of intelligence. For a start, a significant body of opinion maintains that the very notion of a simple measure of 'intelligence' is deeply problematic.[7] The argument exists at several levels. Some question the very notion of intelligence;[8] some argue that there are intelligences rather than intelligence;[9] some admit the existence of intelligence but maintain that the problems in measuring it are insurmountable. In essence these arguments deny the academic worth of any research programme concerned with measuring intelligence.

Then there are arguments that, while they accept the notion of simple measures of intelligence, deny the academic worth of research programmes concerned with the genetics of intelligence. Such arguments may point out the extent to which we live in an age that inappropriately reifies the gene,[10] or assert that no methodology can untangle the relative contributions made by the genes and the environments in which each of us has lived.

Then there are the arguments from history. As is now widely accepted, attempts by previous generations, and more recently, to measure intelligence have all too often led to unwarranted prejudice and discrimination against black people, women, working class people and others.[11] Historical arguments, when pointing to what we should or should not do in the future rather than simply commenting on what we did in the past, take various forms. In one form, it can be maintained that the very notions of 'intelligence' and / or 'genetics' are so tainted with racism,

sexism and classism that, at least for the foreseeable future, it simply won't be possible to carry out a value-neutral study in this area.

A somewhat different argument might be termed 'The wife of the Bishop of Worcester' argument. On hearing of Darwin's theory of evolution by natural selection, the wife of the Bishop of Worcester is said to have exclaimed to her husband 'Descended from apes! My dear, let us hope it is not so; but if it is, that it does not become generally known'. In other words, there are some things we might prefer (ourselves and / or others) not to know.[12] Such an argument, though easy to ridicule, can easily be elevated to a preference utilitarian argument. For example, apparently around 10% of us, in Western societies, are not the children of our presumed fathers. Perhaps it would be better (for us, for our presumed biological fathers, for our biological fathers, for our mothers, etc.) if we didn't know the truth about our own paternity. A stronger form of this argument might be termed 'The eating from the tree of the knowledge of good and evil' argument. In other words, it is better for us not to know certain things. For example, some would argue that the world would be a better place if we did not know how to split the atom.

It is easy to propose possible reasons why it might be preferable or better for us not to know about the genetics of intelligence. After all, suppose the results of such research show, appear to show or at any rate are widely taken as showing that there is an inherited component to intelligence with consistent and statistically significant (even if minor) differences between the average intelligences of different racial groups. Suppose further that these racial differences correlate (at least on average) with the possession of certain alleles. Might not such knowledge lead, on the one side (those with high intelligence), to racism or greed (The 'It's not worth educating them' viewpoint) and on the other side (those with low intelligence) to people becoming disheartened, envious or bitter ('However hard I work, I'm not going to pass my exams / get a well paid job')?

Further, one can imagine that evidence that intelligence does have a genetic component will lead to an increase in prenatal testing and a consequent increase in selective terminations. Whatever one's views about abortion, it is easy to see such a scenario leading to less overall happiness.

V SPECIFIC ARGUMENTS IN FAVOUR OF CARRYING OUT RESEARCH ON THE GENETICS OF INTELLIGENCE

Finally, there are the various specific arguments in favour of carrying out research on the genetics of intelligence though it has to be said that there is a very considerable degree of speculation about these advantages. One such argument is the apparently chauvinistic one: 'Research in this area will happen anyway and if we do it the consequences won't be so bad as if someone else does it'. This argument has appeared in connection with the possibility of human cloning. Such an argument doesn't seem to me to be a strong one but I could imagine situations in which it would have a certain force. After all, if there are significant differences between

countries and research institutions in the quality of the research they are likely to carry out (which there are), I would rather the research, were it to be undertaken, was carried out in the highest quality establishments.[13]

For a very different argument in favour of carrying out such research, suppose that the genetic influence on intelligence turns out to be rather small, or at any rate, typically subordinate to environmental influences. This might take a lot of the heat out of the argument about the genetics of intelligence and help us to think more carefully about whether or not we want future generations to be more intelligence. It might, indeed, lead to reflection on what exactly is a valuable life. If people decide that high intelligence does contribute to 'the good life', we might more critically turn our attention to ways of arriving at environments that increase intelligence.

A further benefit of research in this field is that it might lead to a better understanding of gene-environment interactions by the general public. Until recently the repeated publication in the non-specialist media of 'gene for ...' stories may have simply re-inforced a public equation of 'genes' with 'inevitability'. As everyone who works in the field acknowledges, this equation is completely invalid: just think of phenylketonuria. Change the environment (i.e. a different diet during childhood) and the effect of the mutant gene disappears. Some tangential evidence in support of the notion that research into the genetics of intelligence (or just about any other human trait[14] including personality as well as diseases including psychiatric diseases) might lead to better public understanding comes from the accumulating evidence about the public understanding of science. It is encouraging to note that while the average person doesn't do very well on simple factual questions about science (e.g. 'Where does most of the mass of a tree come from?', 'Which is bigger, a cell or a gene?'), people frequently show a fine understanding of particular aspects of science when those particular aspects directly impinge on them.[15] It is possible that advances in genetics, including research on the genetics of intelligence, will lead people to have a better understanding of the limitations of 'the gene for ...'-type stories and that this will especially be the case when the genes in question are relevant for particular people.

The above purported benefits are concerned with many people having a better understanding about the nature of inheritance. To most people a far more important benefit would be that the results of the research might enable us to find better ways of increasing people's intelligence. To evaluate this possible benefit involves two stages, first addressing the issue about the presumed connection between a person's intelligence and their quality of life; secondly, reviewing (at least, attempting to) the likelihood that research advances in this area would lead to increases in people's intelligence.

So, first, what is the connection between a person's intelligence and their quality of life? (We are not, of course, examining the relationship between a person's intelligence and their worth but between a person's intelligence and their quality of life.) There is considerable evidence in favour

of the common-sense notion that, at least up to a certain point, the higher a person's intelligence, the higher their quality of life. (The proviso 'up to a certain point' is because the evidence is, I suspect, stronger when comparing, say, an IQ of 70 with 100 than one of 120 with 150.) Certainly, in the USA a higher IQ correlates well with higher earnings, a lower likelihood of being arrested for a very wide range of non-traffic offences and lower prevalence of HIV infection.[16] Now there is more to life than having a well-paid job, staying out of prison and being healthy, and quantitative measures of this sort are always somewhat crude. A different approach is to note that not many people spend much effort trying to make themselves or their children less intelligent whereas a lot of people spend considerable time and money educating themselves and their children in ways that help them to score better on IQ tests even if this isn't their specific intention. Logically each of us could be content with the intelligence we have, prefer a higher intelligence or prefer a lower intelligence. My bet is that not many people are in the third category. Certainly, anyone who has ever spent much time with either retarded or profoundly retarded people is likely, I contend, to accept that, other things being equal, it is preferable to have an IQ at or around the average rather than far beneath it.

If we accept that there is benefit in helping people to be more intelligent, how likely is it that research on the genetics of intelligence will help in this aim? Wouldn't it be better to carry out research on more effective ways of educating people or simply to forget the research and put into practice all we know about high quality child-rearing and teaching?[17]

At present it is very difficult to believe that answers to such questions can be given with much confidence. Advances in genomic medicine suggest that we cannot discount the possibility that research into the genetics of intelligence may lead to more appropriate targeted help for different categories of children. It is already clear that conditions associated with low intelligence, such as poor language development, can have genetic components.[18] The phenylketonuria example cited earlier illustrates not only that genes can, in the usual sense of the word, 'cause' low intelligence, but that understanding the biochemical reasons for this can lead to successful interventions. Perhaps we really will find a variety of ways of boosting the intelligence of children who would otherwise grow up with either generalised low intelligence or various specific learning difficulties such as dyslexia. And if we don't, and instead find out that we can't, at least we will know that we can't.

V CONCLUSION

My own judgement is that, if a decision has to be made one way or another, then the time is approaching when the arguments in favour of carrying out research on the genetics of intelligence will prevail. However, I want to emphasise the provisionality of this conclusion. In part this is because of existing empirical uncertainties about what such research might reveal and how people would react to such revelations. In part, though, it is because of the continuing

disagreement within applied ethics as to how complicated ethical questions are to be answered when there is genuine uncertainty about the very framework(s) within which such questions should be addressed.[19]

Footnotes

1. See, for example, Philip Kitcher, The Lives to Come: The Genetic Revolution and Human Possibilities (Simon & Schuster: New York, 1996); Nuffield Council on Bioethics, Mental Disorders and Genetics: The Ethical Context (London: Nuffield Council on Bioethics, 1998).

2. 'Because it's there' was George Mallory's famous answer when asked why he wanted to climb Mount Everest. Mallory died on Everest on or soon after June 8, 1924.

3. See Peter Unger, Living High and Letting Die: Our Illusion of Innocence (New York: Oxford University Press, 1996), especially Chapter 6. For a passionate defence of the view that it is wrong to restrict research on human nature see Morton Hunt, The New Know-Nothings: The Political Foes of the Scientific Study of Human Nature (Transaction Publishers: New Brunswick, New Jersey, 1999).

4. Stanley Milgram, 'Behavioural study of obedience' Journal of Abnormal Psychology 67 (1963), 371-8.

5. Udo Schuklenk, Edward Stein, Jacinta Kerin and William Byne, 'The ethics of genetic research on sexual orientation' Hastings Center Report 27(4) (1997), 6-13; Udo Schuklenk and Robert A. Brookey, 'Biomedical research on sexual orientation: researchers taking our chances in homophobic societies' Journal of the Gay and Lesbian Medical Association 2(2) (1998), 79-84.

6. Alan E. H. Emery and Robert F. Mueller, Elements of Medical Genetics, 8th edn (Churchill Livingstone: Edinburgh, 1992).

7. For a recent review, one of many, see Michael J. A. Howe, IQ in Question: The Truth about Intelligence (SAGE: London, 1997).

8. H. Gardner, Frames of Mind: The Theory of Multiple Intelligence (New York: Basic Books, 1985).

7. R. C. Lewontin, The Doctrine of DNA: Biology as Ideology (Penguin: London, 1991/1993).

10. Dorothy Nelkin and M. Susan Lindee, The DNA Mystique: The Gene as a Cultural Icon (W. H. Freeman: New York, 1995).

11. See Steven Rose, R. C. Lewontin and Leon J. Kamin, Not in Our Genes: Biology, Ideology and Human Nature (Penguin: London, 1984/1990); Stephen Jay Gould, The Mismeasure of Man (Pelican: Harmondsworth, 1981/1984); Hamish G. Spencer and Diane B. Paul, 'The failure of a

scientific critique: David Heron, Karl Pearson and Mendelian eugenics' British Journal for the History of Science 31 (1998), 441-52.

12. Darwin, married to his cousin Emma Wedgwood, was interested to know whether children resulting from cousin marriages were less likely to survive than children resulting from marriages between non-relatives and pushed to have such information collected in the Census. However, on 22 July 1970 Darwin's proposal, introduced by his neighbour and protŽgŽ, John Lubbock, was defeated by a margin of two to one during the second reading of the Census ill. The proposal was said in the debate to be "the grossest cruelty ever thought of" and could result in "mental torture" to first cousins - see Adrian Desmond and James Moore, Darwin (Penguin: London, 1991/1992, p. 575).

13. Lantz Miller, 'Filling the gaps in the risks vs. benefits of mammalian adult-cell cloning: taking Bernard Rollin's philosophy its next step' Journal of Agricultural and Environmental Ethics 11 (1998), 1-16 argues with regard to human cloning (HC): 'Finally, HC advocates intimidate us via the warning that if we do not do HC, someone in some nefarious place will, and the worse for everyone. That contention is no ethical argument. Bans on snuff pornography do not stop it from being made in other countries, but that does not mean we do not have the ethical obligation to try to curtail it' (p. 15). The rhetoric is impressive but the point is surely that whereas we can agree that snuff pornography is wrong, this is less clear about human cloning and research on the genetics of intelligence. Given such lack of clarity there can be, as I indicate in the text, arguments for it being better to carry out such practices in certain places rather than others. Snuff pornography, on the other hand, is unacceptable wherever it is undertaken.

14. For evidence that personality has a significant genetic component see Thomas J. Bouchard Jr., 'Genes, environment and personality' Science 264 (1994), 1700-1; Robert Plomin, Michael J. Owen and Peter McGuffin. 'The genetic basis of complex human behaviours' Science 264 (1994), 1733-9; Anne Farmer and Michael J. Owen, 'Genomics: the next psychiatric revolution?' British Journal of Psychiatry 169 (1996), 135-8.

15. See David Layton, Edgar Jenkins, Sally Macgill and Angela Davey, Inarticulate Science? Perspectives on the Public Understanding of Science and Some Implications for Science Education (Studies in Education: Nafferton, 1993); Alan Irwin and Brian Wynne eds., Misunderstanding Science? The Public Reconstruction of Science and Technology (Cambridge University Press: Cambridge, 1996); Theresa Marteau and Martin Richards eds., The Troubled Helix: Social and Psychological Implications of the New Human Genetics (Cambridge University Press; Cambridge, 1996).

16. Robert A. Gordon, 'Everyday life as an intelligence test: effects of intelligence and intelligence context' Intelligence 24(1) (1997), 203-320.

17. By analogy, a great deal is known about how interventions at home and in school can reduce childhood aggression and subsequent criminality yet little use is made of such knowledge. See Stephen Scott, 'Aggressive behaviour in childhood' British Medical Journal 316 (1998), 202-6.

18. Philip S. Dale, Emily Simonoff, Dorothy V. M. Bishop, Thalia C Eley, Bonny Oliver, Thomas S. Price, Shaun Purcell, Jim Stevenson and Robert Plomin, 'Genetic influence on language delay in two-year-old children' Nature Neuroscience 1 (1998), 324-8.

19. So that, for instance, as is well known, Tom L. Beauchamp & James F. Childress, Principles of Medical Ethics, 4th edn (Oxford University Press: Oxford, 1994) provide four vantage points - autonomy, beneficence, non-maleficence and justice - from which any instance of medical action can be regarded. Yet no method is given by which the views from these four peaks can be compared as they must (at least if a 'real view' - i.e. a valid way forward - is to be found) when, as is often the case, they conflict. Even the agreed adoption of a utilitarian framework would not at present be enough to enable the question posed in this paper to be answered with great confidence.

Reiss, M.J. (2000). The ethics of genetic research on intelligence. Bioethics, 14, 1-15.