(B) Collection Methods Although prior informed consent (PIC) is a prerequisite for collection to take place, none of us trust this because of our past bitter experiences. In the Philippines, even contraception has been imposed on people without them knowing, and the simplicity of collecting blood and hair samples makes the acquisition of samples very easy without PIC.

(C) Fate of the materials If our genes are found to have useful characteristics like disease-resistance, will they be commercialized? And if they are found to have susceptibility to particular diseases, we are potential targets for biowarfare. Many indigenous people are thorns in the side of governments and developers, because of their opposition to the building of dams, mines and so on. The easiest way to kill the protest is to release genetically engineered disease carriers into communities, just as smallpox virus was introduced into Indian communities in the Amazon.

We are told that the results are not for commercial ends, but we have little reason to trust the researchers. Patents have already been taken out on the cell lines of indigenous people without their consent (see p. 90), so our fears about the fate of our genes are not unfounded. The scientists may have valid intentions, but what happens when the information gets into the hands of industry? As part of a 'medical' mission a Hoffman–la Roche subsidiary is already collecting genetic material from the Aeta pygmies in the Philippines.

(D) Impact on ancestral rights The project is to be used to study migration patterns. Does that mean that if Aborigines are shown to have come from Asia originally, this evidence can be used to deny their rights to their ancestral homes?

5.3. Glorification of the Genes – genetic determinism and racism in science

ALAN GOODMAN

Introduction

Most scientists know about the existence of the Human Genome Project (HGP)* and consider it to be biology's first 'big science project', patterned after the Manhattan Project and Los Alamos Atomic Bomb Projects. Biologists are quick to point out the advances made through the development of polymerase chain reaction technologies (used to replicate DNA in genetic engineering techniques) and that great strides are being made in working out the genetic code. They may also mention that genome research is well funded, and may realize that this takes away funding from other biomedical projects. Yet many scientists have not realized that something unusual is going on in biomedical research: something intense, fast-paced and potentially threatening. Only a few seem concerned with the ideological consequences of genomics or the economic and social implications of the commercialization of genetic information. These considerations are left to others.

Compare this lack of concern with views expressed in a recent popular book. The biotechnology revolution is said to be based on research that is 'thoughtless and frivolous'. The commercialization of molecular biology is described as 'the most stunning ethical event in the history of science'. Biotechnology is 'the greatest revolution in human history' . . . 'By the end of the decade [it] will have outdistanced atomic power and computers in its effect on our everyday life'. Finally, with the promise of private research funds and shares in biotechnology companies, 'Suddenly it seems as if everyone wanted to become rich'. Who sounds these warnings? It is Michael Crichton in the first two pages of *Jurassic Park*.[1]

This paper aims to explore some of the potential implications of genetic manipulation and examine the connections between hereditarianism, racialism and racism. Hereditarianism (or genetic determinism) is defined as the belief that patterns and differences in biology and behaviour are predominantly caused by patterns and variation in the genome.[2,3] It is the 'nature' in the 'nature–nurture' argument. Racialism

* The European branch of the Human Genome Project is managed by the Human Genome Organization (HUGO).

In: *The Life Industry: Biodiversity, people and profits.* Miges Baumann, Janet Bell, Florianne Koechlin and Michel Pimbert, eds. London: Intermediate Technology Publications, 1996.

(or scientific racism) is the belief that humans are divisible into a finite number of types (races) and that individual biology and behaviour are explicable by race.[4] Racism is the belief in the superiority of certain races over others, combined with the power to act upon that belief.

Three issues will be discussed here:

- the problems of using race as a model of human variation
- trends toward hereditarianism and racialism in biomedical research
- the concurrent recent rise of genomics and hereditarianism in biological anthropology (as illustrated by the Human Genome Diversity Project) and how it gains legitimacy from the existing currents of racialism and racism.

Race in anthropology in the 1990s

The biological concept of race is often wrongly used as shorthand to refer to human biological variation. A racialist model of human variation suggests that humans are divisible into a finite number of nearly separate subspecies. However:

- Human variation is nonconcordant; that is, variation in one trait says little about variation in another. Height can predict weight but little else – not blood type or skin colour. So it is true to say that 'race is skin deep.'
- Variation is continuous, thus it is arbitrary where one group begins and another ends.
- Race explains only about 6% of human variability in a statistical sense,[5] and in a biological sense it explains even less. This is because what is generally assumed to be explained by race can just as well be explained by geographical proximity.

In short, human variation is real; race is an idea.

The forensic anthropologist tries to match skeletal remains with a previously living person. Forensic anthropologists justify their practice of racing skeletons by saying that 'race' is what law enforcement agencies want. But this is not true: agencies want to identify individuals and to know their 'official' race so that a form can be filled in. Forensic scientists continue to confuse official race with biological race and to reify race (i.e., to make it real or material) by complying with law enforcement needs without educating law enforcement agencies about the realities of human variation. Two listings from a recent catalogue of skulls universally used in the teaching of human biology and variation[6] give some insight into learning how *not* to

question the reality of race. The first listing is labelled 'negroid male'. The description of the skull states that it 'illustrates racial traits very well . . . this is wonderful cast!' The skull below is labelled 'caucasoid female'. It is described a similar fashion: 'illustrates racial traits very well . . . this is in excellent condition!'

What is the message here? Students do not learn about the discontinous and nonconcordant nature of human variation. Instead human variation is reduced to how well crania fit essentialized types and students learn a simplistic story about unchanging types of people. The presentation of these casts speaks volumes for the theory disseminated to those who work in the industry of forensics and physical anthropology.

But what does this have to do with genes? Firstly, race is all about 'essentializing' types of people – separating and dividing groups as if they were primordial types. It sees things in black and white. It does not allow for complexities of interactions or shadings. Hereditarianism shares similar essentialisms. Secondly, inflating the significance of race often follows from a prior inflation of the significance of genes.[7]

Glorification of the genes

Two fundamental problems arise repeatedly in assuming that differences in the expression of a complex trait are genetic and can be generalized to a racial propensity or predisposition. Firstly, the environment is seldom controlled or factored in. Secondly, the results – once assumed to be genetic – are reduced to equating genetic with pan-racial. Thus, we often are faced with the double leap of faith that a given disease is genetic in origin, and then that a genetic difference observed between two populations in one place will necessary apply to populations in other places. This assumes that the same variations in haemoglobin levels seen in black and white populations in the USA will be observed between blacks and whites in, say, Australia.

Research on race and anaemia provides an example of this double leap of faith. In the 1970s Garn reported that the adult black mean haemoglobin level was 1.0g/dl below the white mean.[8] Following this work the suggestion was made to institute separate cut-offs for anaemia for blacks and whites, in which blacks have a lower cut-off. Robert Jackson[9] re-examined these data and endeavoured to control for obvious environmental factors such as iron intake, and to eliminate from analysis low haemoglobin values that may be related to genetic anaemias. This reduced the mean haemoglobin difference by about 75% to around 0.20–0.30 g/dl.

Despite these data, separate cut-offs are still supported despite the fact that the purported 'race' difference in iron metabolism has no known genetic basis. There is certainly no evidence to suggest that

blacks are uniformly more efficient than whites in their metabolism of iron, or that blacks somehow do just as well on less haemoglobin. Nor has it been proven that the difference is pan-racial. If the black cut-off is reduced by just half of the original proposed level, the prevalence of anaemia in nonpregnant, nonlactating black women would on paper be reduced from 20 to 10%.[10]

The health implications of this would be serious. The consequences of low haemoglobin values in ranges near anaemia cut-off values manifest in many ways in learning, work, immunological capacity and many other areas.[11] This is an example of how poor science thus becomes harmful public policy.

It's not all bad, however. A recent report from the US Centers for Disease Control makes clear that linking race with genetics is a serious constraint to public health. Among its conclusions are that 'race – as a biological concept – is not useful in public health surveillance.' Furthermore, emphasis on race in public health reinforces stereotyping and racism and diverts attention from underlying socio-economic factors.[12]

Race, hereditarianism, and anthropology

According to Daniel Koshland, the editor of *Science*, the nature–nurture debate has ended and nature has won: 'It is in the genes.'[13] The 'it' in question is anything from why black babies are smaller or black women are more anaemic, to sexual prowess, athletic ability, homosexuality, criminality, and even homelessness.

There are two major concerns in this hereditarian/biotechnology future. One is that the payoffs of genome research will be overstated. As one doctor stated in an article in *Time* magazine, soon all we will have to do to cure the myriad diseases facing society is 'simply treat patients by injecting a snippet of DNA and send them home cured'.[14] But this is far from the reality. These two examples illustrate how the oversold nature of genomic information and the sloppy process of naming genes by scientists and the media lead to misrepresentations of the scope and power of genomics.

Perhaps the greatest success of genome research to date in the location of the BRCA-2 gene. This gene is implicated in an estimated 2–4% of women who might develop breast cancer. How does locating the gene help us? Having the gene dramatically increases one's likelihood of getting cancer. However, it is not certain when, or even if, one ever will, but knowing one has the gene is likely to increase the probability of cancer developing. Knowing one doesn't have the gene is useless information. Worse, the information is something about which we can do little, since therapy lags way behind diagnosis.

Overselling is one concern; actual doing is the greater worry. One new application of biotechnology is the treatment of the medicalized condition of short stature. Genentech, one of the first biotechnology companies, markets a genetically engineered form of human growth hormone (HGH). Physicians are free to prescribe it to treat children who for any reason are short. A Genentech scientist recommends that HGH be considered for any child in the shortest 3% of the population.[2] Treatment of the lower 3% in the US alone would yield a $9 billion annual market!

Growth hormone is a powerful, wide-spectrum hormone with many systemic effects, some known and some yet to be determined. The only certainty is that HGH will do much more than promote an increase in linear growth. Secondly, the bottom 3% of a distribution is never lost. If those in the bottom 3% are moved up in the distribution then there will still be a low end 3%. What happens now? Do the new lower 3% get discriminated against because they are short? Do they then take growth hormone therapy?

What is happening here is exploitation for profit of an ideology favouring tallness in males.[2] This raises great ethical concerns, especially when only some can buy tallness. Where will this commodification stop? What would be wrong with a mammary gland growth hormone to increase 'attractiveness' in females? And in any case, what is so terrible about short stature? In richer countries, short stature is the result of complex interactions between genes, and between genes and environments. It is not, however, a health threat.

Among the poor, short stature is much more meaningful because it is caused by lack of access to food and other basic resources. Thus, short stature is a sign of other consequences of this lack of access, such as increased disease rates and learning difficulties.

The longest uninterrupted nutritional study has been going on in the town of Tezonteopan in highland Mexico since the late 1960s.[15] The mean difference in height between children receiving nutritional supplements and non-supplemented children at age 10 years was found to be 12.5cm. To treat short stature with HGH in Tezonteopan is to treat only the symptoms. In fact, growth hormone probably would not work if, as in this case, nutrients are not available to convert to human tissue. Access to nutrients is far more important for growth. The difference that good nutrition makes is very real and very powerful. Yet it does not make the headlines, and it does not make very many people rich.

The human genome diversity project

The Human Genome Project (HGP) embodies the rise in thinking that human nature is profoundly gene-based. It has enormous socio-

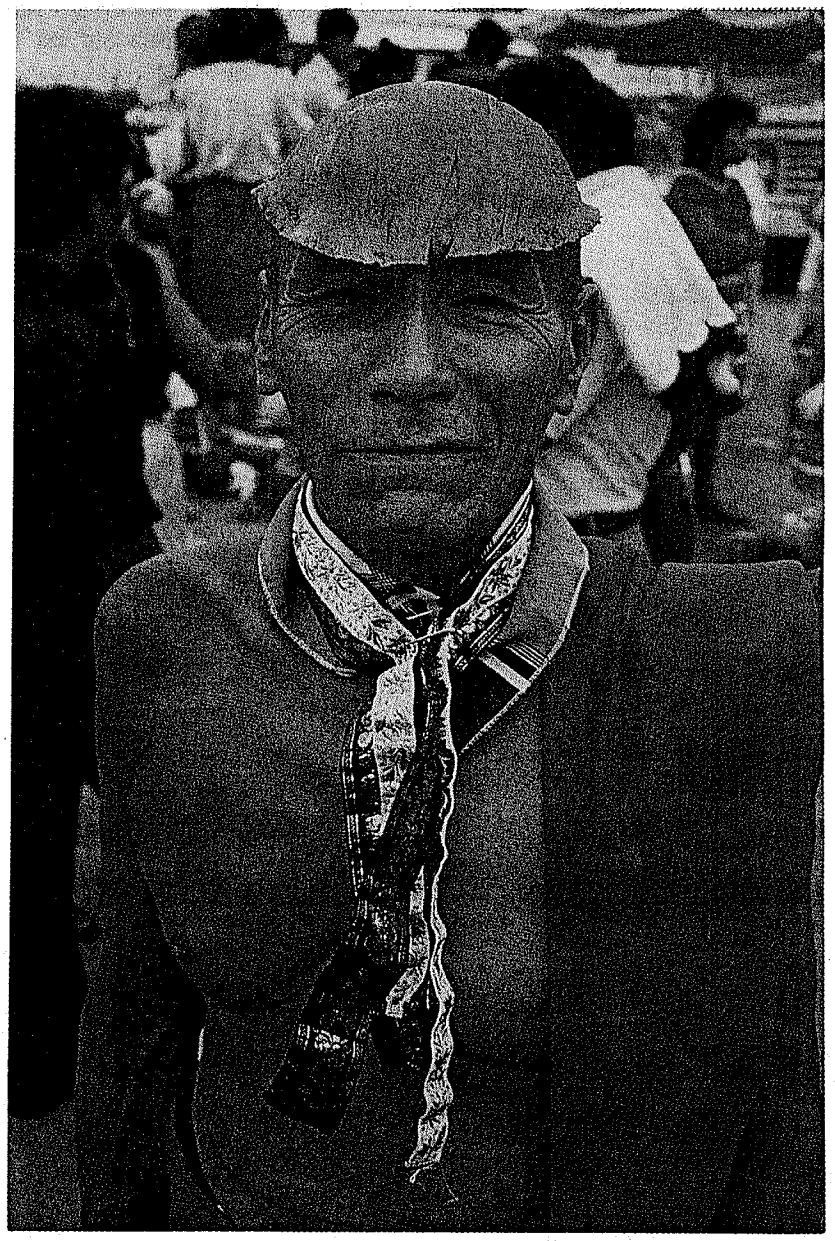
political and economic implications. The HGP has already changed the course of biological research dramatically. It is not hard to see why legislative and financial support has been garnered with rhetoric from influential people like James Watson who stated that: 'We used to think our fate was in the stars, now we know, in large measure, it is in our genes.' As big as the project is, however, it is merely a symptom of deeper currents flowing within and between biomedicine and society.

The Human Genome Diversity Project (HGDP) is the anthropological arm of the Human Genome Project. As it was envisioned by population geneticist Luca L. Cavalli-Sforza, the founding father of the initiative, the HGDP will supposedly rectify an important limitation of the HGP, which was to look at a single genome, not the diversity among human genomes.[16] This project is regarded as the 'politically correct' Human Genome Project because it acknowledges variation and has a strong conservation biology rhetoric.

One of the organizers of the HGDP, Mary-Claire King, justifies this work because finally we have the know-how and because diversity is rapidly decreasing due to intermarriage and genocide.[17] Cavalli-Sforza is reported to have said that 'Anthropological fieldwork must catch up . . . with the rapidly disappearing data. Priceless evidence is slipping through our fingers as aboriginal populations lose their identity.'[16] Of course, this is neither the first time that scientists have bemoaned the disappearance of 'priceless evidence', nor the first time that one hears the argument that we must do research simply because we have the means.

Early on in HGDP planning, the big debate focused on sampling strategies, i.e. which groups and individuals would be selected and how many samples would be taken.[17] The late Allan Wilson favoured a uniform sampling strategy, in effect placing a grid over the world and selecting samples based on locations on the grid. But wider support was forthcoming for the more traditional method of selecting known 'anthropological' populations. This method clearly leads to a reification of population differences: the sampling methodology prejudices for finding differences between populations because transitional individuals and groups are eliminated. In this way, the HGDP could actually reinforce the belief in the biological basis of racism, rather than dispelling it, which is supposedly one of its aims.

The desire for acquiring data, and getting it as fast as possible, drives the project strategy. This is implicit in Cavalli-Sforza's answer to the questions about the scientific rationale for selecting 50 individuals per group: 'One person can bleed 50 people and get on the airplane in one day.'[17] Although issues of sampling are important ones, they may also deflect attention from the more fundamental questions of the



First they took the red paste in his hair for food colouring; now bioprospectors want this Colorado Indian's genes. (WWF/Parker, Edward)

scientific and humanitarian payoffs of the project. Will it be racialist science, and even lead to racism? Or will it increase our understanding of the invalidity of race, who we are, and our predispositions to disease? This much is certain: much of what the project becomes needs to result from thoughtful discussion, not just doing something because it is doable.

The HGDP, as it is envisioned, has the markings of violently reductionist science with a mechanistic and overly-deterministic approach to human biology. There is no built-in effort to examine interactions between genes, or between genes and the environment. In fact there is no discussion of gathering contextual information that would make this possible. Eventually sequencing strings of DNA can lead to the view that the person *is* the string.[18] Without contextual information, which would certainly slow down the project and make it more expensive, it is hard to envision how the project will do more than provide additional data on small and trivial polymorphic differences. It is repeatedly promised that the project will provide keys to understanding susceptibility to disease,[19] but this is not possible if all we have is genes without contexts.

Three slippery goals of the HGDP have been expressed by its proponents:

- it will be a key to showing the invalidity of race
- it will provide data to reconstruct human history
- it will help to provide information on genetic patterns of disease susceptibility.

However, we already have the data to show that race has little explanatory value, and Cavalli-Sforza has himself stated that sufficient genetic data are already at hand to map lines of descent of populations of the world.[20] Furthermore, there is no reason to believe that the new data that may arise from the HGDP will lead to obvious or statistically less ambiguous ancestral trees. Finally, the methodology is not robust enough for studying disease causation. At best, the resulting data will provide preliminary associations between gene frequencies and disease. Thus, a real concern is that the project's intellectual payoffs will continue to be overstated and this will eventually turn public support away from science and anthropology. The pronouncement of King that the project will tell us 'who we are as a species and how we came to be'[16] is a slightly overblown claim.

Most concerning of all is the oversimplified idea of human variation that the project reifies. How will the mapping and comparing of thousands of DNA samples help us to appreciate the complexities of human biology and biocultural interactions?

Finally, behind the Newspeak of 'conservation biology' it is clear that the objects of conservation are genes, not peoples, nor cultures. It is no wonder that a number of indigenous groups, having finally learned about the project, have declared that they will not support it. Onendagah Council Chief Leon Shenendoah succinctly calls it a 'make work' project. Some may say that this work has nothing to do with race. But on a deep level I believe the discourse often invokes race. Genes are unthinkingly labelled as 'African' genes or 'Caucasian' genes, and scientific and popular articles discuss the evolution of races as if race were a reality.

Conclusions: genes, race and racism

Racism has recently thundered back into the discourse on genes and race. Three books published in 1994 on race and intelligence[21,22,23] all re-invent the following syllogism of Jensen[24] from a quarter of a century ago:

IQ = intelligence
IQ is inherited
Blacks have lower IQ than whites
Therefore black are inherently less intelligent than whites

I thought we had dealt with this already. I thought we had already shown that IQ was not an unbiased proxy for the complex trait called intelligence. I thought we had seen that much of the data on the heritability of IQ had been manufactured, literally so. I thought we had shown that blacks and whites are not groups. These ideas survive and resurface because they are keys to maintaining a power structure. This is, as Murray says, 'social science pornography'.[25]

Belief that human nature is driven by our genes is all around us. We find it in questions asked by doctors about family histories; in a newer form in the development of biotechnology companies; and the reporting of new genetic discoveries in our daily newspapers. The popular press tells us that there are genes dictating complex biological and behavioural traits – cancer genes, gay genes, violence genes.

But has nature/geneticization won, or is it just getting favourable press releases? Has nature been placed in the winner's enclosure simply because it is potentially profitable to do so? Stepping back from the media hype, what do the data suggest?

- Race is a reified idea of paradigmatic magnitude. It is a worldview that is associated with a desire to separate *us* from *them* and to create power structures. The concept is dangerous, scientifically flawed, and should be abandoned.

- The denial of race is not a denial of human diversity. Rather it is a stance that suggests that human diversity is too complex to be explained by types. Similarly, human biology is more than strings of beads and mechanics. Humans are not composed of replaceable parts. A goal of biological anthropology should be to explain biocultural complexity.
- We have entered a historical phase of glorification of the gene. This is consistent with the search for simple biological solutions to complex problems, and it is also consistent with an upsurge in racialism. Genetic reductionism does not lead directly to racialism or racism. However, if one can use the past as a gauge then we see the extreme likelihood of such connections being made.
- Racism is more real than race. To deny race does not deny the study of racism. Race as biology and racism are often considered in human biological research, especially in studies of group differences in health and nutritional status. What is needed are more studies of the biological consequences of racism. The *status quo* is not OK. 'Nothing could keep race alive if we did not constantly re-invent and re-ritualize it. If race lives on today it is because we continue to create and re-create it'.[26]
- Genomics is popular because genetic information is patentable and perceived to be controllable; but control is a myth. The lesson of Jurassic Park, in the words of the chaos mathematician Malcolm, is that nature is not controllable. Properties emerge and are stochastic. Life is dynamic and dialectical. Life will get you.

References

1. Crichton, M. (1990). *Jurassic Park.* Ballantine Books, New York
2. Hubbard, R. and Wald, E. (1993). *Exploding the Gene Myth.* Beacon Press, Boston.
3. Lippman, A. (1992). Led (astray) by Genetic Maps: The Cartography of the Human Genome and Health Care. *Social Science and Medicine* **35**(12): pp.1469–76.
4. Todorov, T. (1993). *On Human Diversity.* Harvard University Press, Cambridge, MA.
5. Lewontin, R.C. (1972). The Apportionment of Human Diversity. *Evolutionary Biology* **6:** 381–398.
6. France Casting (1992). *Fall 1992 Catalogue.*
7. Goodman, A.H. and Armelagos, G.J. (1995) The Resurrection of Race: The Concept of Race in Physical Anthropology in the 1990s. In: LT Reynolds and L Liberman (eds) *Race and Other Miscalculations, Misconceptions and Mismeasures: Papers in Honor of Ashley Montagu,* General Hall Publishers, Dice Hill NY.

8a. Garn, S.M., Smith, N.J. and Clark, D.C. (1974). Race Differences in Haemoglobin Levels. *Ecology of Food and Nutrition* **3:** pp 299–301.

8b. Garn, S.M., Ryan, A.S. *et al.* (1975). Income Matched Black–White Differences in Hemoglobin Levels after Correction for Low Transferrin Saturations. *American Journal of Clinical Nutrition.* **28:** pp 563 -568.

8c. Garn, S. (1976). Problems in the Nutritional Assessment of Black Individuals. *American Journal of Public Health* **66:** 262–267.

9a. Jackson, R.T. (1990). Separate Hemoglobin Standards for Blacks and Whites: A Critical Review of the Case for Separate and Unequal Hemoglobin Standards. *Medical Hypotheses* **32:** pp 181–189.

9b. Jackson, R.T. (1992) Hemoglobin Comparisons between African American and European American Males with Hemoglobin Values in the Normal Range. *Journal of Human Biology* **4:** pp 313–318.

9c. Jackson, R.T. (1993) Hemoglobin Comparisons in a Sample of European and African American Children. *Ecology of Food and Nutrition* **29:** pp 139–146.

9d. Jackson, R.T. and Jackson, F.L.C. (1991). Reassessing Hereditary Interethnic Differences in Anemia Status. *Ethnicity and Disease* **1:** pp 27–41.

10. Pan, W.H. and Habicht, J.P. (1991) The Non-Iron Deficiency-Related Differences in Hemoglobin Concentration Distribution between Blacks and Whites and between Men and Women. *American Journal of Epidemiology* **134:** pp 1410–1416.
11. Scrimshaw, N. (1991). Iron Deficiency. *Scientific American.* October, pp 46–52.
12. Morbidity and Mortality Weekly Report (1993). Use of Race and Ethnicity in *Public Health Surveillance* **42** (No RR-10).
13. Koshland, D. (1987). Nature, Nurture and Behavior. *Science* **235:** 1445.
14. *Time,* 17 January 1994.
15. Chavez, A. and Martinez, C. (1979). *Growing Up in a Developing Community.* Mexican National Institute of Nutrition, Mexico City.
16. Roberts, L. (1991). A Genetic Survey of Vanishing People. *Science* **252:** pp 1614–1617.

17a. Roberts, L. (1992) Anthropologists Climb (Gingerly) on Board. *Science* **258:** pp 1300–1301.

17b. Roberts, L. (1992). How to Sample the World's Genetic Diversity. *Science* **257:** pp 1204–1205.

18. Lewontin, R.C. (1991). *Biology and Ideology: The Doctrine of DNA.* Harper Collins, New York.
19. Kidd, K.R., Kidd, K.H. and Weiss, K.M. (1993). Human Genome Diversity Initiative. *Human Biology* **65:** pp 1–6.
20. Cavalli-Sfoza, L.L. (1991). Genes, People and Languages. *Scientific American.* November, pp 104–110.
21. Herrnstein, R. and Murray, C. (1994). *The Bell Curve: Intelligence and Class Structure in American Life.* Free Press, New York.
22. Itzkoff, S.W. (1994). *The Decline of Intelligence in America.* Praeger,Westfield, Conn.
23. Rushton, J.P. (1994). *Race, Evolution and Behavior.* Transaction, New Brunswick.

24. Jensen, A.R. (1969). How Much Can We Boost IQ and Scholastic Achievement? *Harvard Educational Review* **39:** pp 1–123.
25. DeParle, J, (1994). Daring Research or 'Social Science Pornography?' *New York Times Magazine*, 9 October.
26. Fields, B.J. (1990). Slavery, Race and Ideology in the United States of America. *New Left Review* pp 95–118.

PART 3

Which way now?