REVIEW ESSAY

What is genethics?

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''Genethics'' is a neologism probably best kept within scare quotes. Yet now that genethics has a Companion—*Companion to Genethics*, edited by Justine Burley and John Harris, Oxford, Blackwell, 2002, 489 pages, £65—it would appear that we can no longer keep our gloves on when handling the term. Burley and Harris's enormous collection contains 34 articles, an introduction and an afterword.*

Most of the contributions are short (ten to twelve pages), many are new, a few are lifted from earlier work and some are lightly revised versions of earlier pieces. Topics range from the genetics of old age, to the Darwin wars and biotech patenting. The collection's length and scope make it impossible to review comprehensively. In brief, many of the contributions are excellent. The pieces towards the end of the volume—Sorrell's on insurance, Munzer's on patents and property rights, Steiner's on self ownership, to mention a few—are especially good at bringing serious philosophical analysis to questions of immediate political concern. A high proportion of the essays are devoted to issues of commercialising the genome and genetic research, and these are all good. The guides to further reading that come at the end of each article are also useful, although it is hard not to grin at an astonishing guide at the end of Dawkins's piece on genetic determinism that includes all and only books by Richard Dawkins.

Rather than arbitrarily selecting an article or two for in depth treatment, or saying something intolerably brief about each of the contributions, let me instead use this essay to offer some reflections on the existence of the volume. What, exactly, is genethics, that it requires a companion? The obvious answer to that question is that genethics is the study of the ethical issues that arise out of the science of genetics and the uses of genetic technologies. That will do as a first pass, but it raises two further questions: how, exactly, are we to demarcate which technologies and pieces of knowledge fall within the scope of the new genetics, and do these technologies and pieces of knowledge pose any distinctive ethical problems? Or, more briefly, what is genetics, and is it special? The second question is addressed briefly in papers by Annas, Rovane, and Powers among others, but I am surprised there is no extended discussion of either one in the volume. I will tackle them in reverse order.

IS GENETICS SPECIAL?

I have already been unfair to genethics. The quick definition of the field as the study of ethical issues that arise out of the new genetics in no way implies that these technologies pose new kinds of ethical problems. One might see the field as an area where quite standard arguments about paternalism, distributive justice, the permissibility of some forms of killing, and so forth, are discussed in relation to a particular set of technologies. It is noteworthy that we do not see *Companions* published that deal with other technologies. There is no similar desire for a companion volume dealing with ethical issues arising out of uses of artificial organs – for example, and certainly no hint that such a set of questions could form a discipline of the sort suggested by a term like ''genethics''. Yet on the face of it such technologies might be thought to raise many similar questions about distributive justice, consent, tampering with human nature, and so forth. So the very appearance of a companion to genethics, rather than a companion to the ethics of artificial organ use, suggests that the marketplace, at least, perceives some special set of concerns that arises from genetics.

Here, again, I am jumping the gun a little. Bioethicists are beginning to realise that the ability to control the mental traits of human beings with precision is likely to come first from psychopharmacological, rather than genetic, interventions. As a result I confidently expect to see a companion volume to ''Neuroethics'', and the widening use of that neologism, within a year or two. A second argument for special concern for ethical problems raised by the new genetics comes from the editors of this volume themselves. At the very beginning of the introduction, (p 1) they tell us:

> No branch of science has created more acute or more subtle and interesting ethical dilemmas than genetics. There have been and still are branches of science that create problems of greater moral importance. Nuclear physics—for example, which gave us atomic weapons and hence the capability, literally, to destroy the world, has presented us with perhaps the ultimate moral dilemma. But it is genetics that makes us recall, not simply our responsibilities to the world and to one another, but our responsibilities for how people will be in the future. For the first time we can begin to determine not simply who will live and who will die, but what all those in the future will be like.

This seems like an overstatement to me. Harris himself is fond of defending genetic engineering on the grounds that it is hard to see how to consistently back restrictions on the abilities of parents to modify the traits of their children through genetic engineering, while allowing parents to modify the traits of their children through sending them to a particular kind of school.[1] In other words, the kinds of schools we support affect what those in the future will be like.

Perhaps the disanalogy is that germline interventions can affect the traits of persons for all generations to come, while interventions in the education system affect only the next few generations. That claim also seems suspect. To begin with biology, germline mutations may well not breed true for ever. In some cases, spontaneous back-mutations might be quite common. Moving to the level of our technological capabilities, if we suppose that we do become masters of genetic engineering techniques, then we will be able to change genes back to their original state, just as we can modify them to form an unusual, or different state. So our having the ability

*All page references are to the Companion, unless otherwise indicated.

to alter the germline entails that such alterations need not be permanent. Equally, if we choose to keep a schooling system of a certain type in place for ever, then its effects on future generations could also be permanent. We can change schooling systems that we decide we would rather not have, and presumably we can do the same with the alterations we make to the germline. Again, we might respond that the real problem is that the alterations we make to the germline may turn out to have longlasting effects that we do not like, and that we will find hard to rectify. Yet the same is the case with new forms of schooling.

One effect of pointing towards our abilities to control the make up of future generations through genetic technologies is to point backwards towards Nazi eugenic practices. The ghost of eugenics haunts much contemporary discussion of the rights and wrongs of genetic screening, and reports commissioned on genetic testing and behavioural genetics typically take great pains to compare and contrast current practices with past eugenics—for example, Kitcher,[2] Buchanan *et al*,[3] and the Nuffield Council on Bioethics.[4] In line with this trend, Paul Weindling's paper discusses the ethical legacy of Nazi medical war crimes, and the light these crimes cast on current genetic research. It is undeniable that modern genetics has strong rhetorical and historical affinities with many forms of eugenic practices. To the extent that eugenics was concerned with controlling the passage of germline material into future generations, we can say that our current best efforts to do the same are indeed rightly seen as the offspring of eugenics. At the historical level of analysis, the thesis that genetics has a uniquely close relationship with eugenics can nevertheless be questioned. Of course many eugenicists were concerned with passage of germline material, yet many were also concerned to ensure that valuable germ material would be properly expressed in suitable environments of upbringing. What Kevles,[5] calls the ''reform eugenicists'' held that both nature and nurture made a difference to an individual's traits. Less familiar, the neoLamarckian eugenicists of Brazil were concerned with a broad variety of postnatal processes that they believed might shape the traits of future generations.[6] Indeed, Stepan's characterisation of many Latin American eugenic policies as concerned in quite general ways with the promotion of the health of children and the nation through scientifically grounded childrearing methods, has strong resonances with today's backing for ''evidence based'' social policy. If the historical net cast over eugenic practices is wide enough then one can also compare current policies relating to education and the family with the eugenics of the past.

Even if we agree that modern genetics has particular historical and rhetorical affinities with eugenics, this does not show it has particular ethical affinities with eugenics. To give one example, an apparent fault of eugenics was its use of state sponsored programmes to control what kinds of people should exist. This feature of eugenics is frequently discussed these days in relation to genetic screening programmes for various disabilities. Yet it is not only genetic screening programmes that can be compared with eugenics in respect of their effects on future generations (Lowenstein's contribution helpfully picks up some of these themes in passing). The UK government has long encouraged women contemplating conception to take folate supplements in order to prevent their babies being born with neural tube defects. Here is a state sponsored programme whose express purpose is to affect what kinds of people should exist in the future, and which is predicated on an assumption that it is better that people with neural tube defects should not exist. It is extremely rare to see parallels with eugenics discussed in such contexts.

Weindling is right to suggest that modern genetics still has lessons to learn from eugenics (p 68). Still, an important question to ask is whether modern geneticists should pay more attention than other scientists to eugenics. If we locate the importance of reflection on eugenics in its power to expose either the need for informed consent in research; or the dangers of a public health model that tolerates considerable sacrifices of individual welfare for the sake of society at large; or the potential ills of a monistic, state endorsed picture of what a proper citizen should be like, then surely researchers in education and town planning have as much to learn from eugenics as geneticists.

Why is there this tendency in bioethics to discuss eugenics when and only when new *genetic* technologies arise? Perhaps we should explain it through a conviction among bioethicists that the powers of genes to shape future generations are so great in comparison to those of other developmental resources, that equal concern about how we regulate non-genetic technologies that might affect future generations cannot be justified. That conviction would certainly explain the content of the passage from Burley and Harris quoted above. I think probably this is not the right explanation—certainly not the only good explanation—yet raising it invites us to reflect on whether modern bioethics, rather than modern genetics, shares eugenics's objectionable genetic determinism. This is a neglected area where reflection on eugenics may teach us important ethical lessons.

WHAT IS GENETICS?

The second problem for establishing genethics as a discipline is that of saying just which technologies, or which pieces of research, fall within its scope. On the face of it the answer is simple: genethics concerns itself with genetics. But why, then, is the very first contribution to this collection devoted to explaining the science of *stem cells*? One would think stem cell research is at best at the periphery of genetics proper. After all, the different cells in the body are all more or less genetically identical—on the face of it what makes something a stem cell is some non-genetic difference between it and differentiated cells. Presumably the response to this challenge is to point out that understanding how stem cells work, and how they differ from other cells, involves understanding how and why genes within these cells are switched on and off, and how they come to settle into certain functions, rather than others. But this looks more like a project that will explain how the whole cell functions—it is not an essentially genetic project. Indeed Svendsen suggests (p 15) that more than genes are involved in determining the fate of the cell: ''…cells from the skin or brain may be switched into other cell types providing the correct genes are turned on or off, or the cells are exposed to an appropriate environment''. One might try to make genes central to this story by arguing that the key to understanding cell differentiation is how genes become activated or deactivated by these other factors. Yet interaction is always a two way process; it's hard to see on what grounds one should say that the ''the bottom line with these studies … is understanding the genes which direct our cells to be what they are'' (p 15), as opposed to understanding the environments and transcription factors which direct how our genes are switched (for a more general approach to decentring genes, see Griffiths and Gray,[7] and Moss[8]).

Interaction quickly becomes a problem for demarcating the subject matter of genethics. Once we agree that genes have their effects only through interactions with other developmental resources, then it becomes difficult to say which organic processes, short of all of them, are properly within the domain of genetics.

This problem is well illuminated by Diane Paul's work on phenylketonuria (PKU) testing,[9 10] and by Kaplan.[11] The PKU test detects a gene product – it does not reveal any DNA sequence directly (whatever ''directly'' might mean here). This test was developed independently of the molecular revolution in genetics. The diet that limits the effects of PKU was developed well before 1953, using the long held knowledge that PKU results from a failure to metabolise phenylalanine. The point is that molecular genetics—the ''new genetics''—plays very little role in the story of PKU testing and treatment. Should we then exclude discussion of the rights and wrongs of such tests, and subsequent questions of how to handle information arising from them, from the realm of genethics?

One might argue for the inclusion of discussion of PKU testing in the scope of genethics on the grounds that PKU is at least partly genetically caused, it is inherited, and the PKU test detects a gene product. This response pushes us quickly towards a very broad reading of genetics and genethics. So long as we believe that bodies are produced by genes and environments acting in concert then all traits are partly genetically caused, and a huge array of medical tests—even a test like asking a patient about her symptoms—are genetic tests in virtue of detecting gene products. In many cases, sciences that do not focus explicitly on genes themselves will then fall within the scope of genethics, in virtue of elucidating some of the downstream mechanisms by which genes have their effects, and the upstream mechanisms that lead to gene activation. Genethics thus becomes, what I suspect it already is, the study of ethical issues that arise in the context of a whole array of sciences and technologies that deal with organic development and organic functioning.

A final surprise in this volume is that the evolutionary sciences are included within genethics's scope. Janet Radcliffe Richards—for example, has a sensible piece summarising her recent book, on how the evolutionary view of the mind might change (more accurately, how it should not change) how we feel about ethical truths and our political ambitions. One obvious reason for expanding the scope of the field to include such sciences is that both the human genome project, and evolutionary psychology, promise to show at some stage in the not too distant future how genes conspire to construct human nature. Yet it is worth noting that the molecular genes of the human genome project, and the selfish genes of many evolutionary theorists, look like rather different things. Beginning with evolution, George Williams has defined a gene as ''that which segregates and recombines with appreciable frequency''.[12] On this view, any portion of DNA on a chromosome in a sexually reproducing organism is a gene, so long as it is small enough. Contrast this with definitions more normally used in molecular genetics that identify genes with DNA sequences from which some particular molecular product is expressed. The point is that the molecular genes that geneticists speak of when they estimate how many genes may be contained in the human genome, and the selfish genes that some evolutionary biologists speak of when they talk of a struggle between selfish replicators, have quite different identity conditions.[13] One notable omission in a collection on the ethics of the new genetics is a piece clarifying these various senses of the word ''gene''. Some such discussion is needed if a genethics ranging over both molecular and evolutionary genetics is to be defended as the possessor of a roughly ''natural kind'' as a subject matter.

PUMP UP THE VOLUME

The preceding arguments constitute reflections on the existence of this book, not strong criticisms of its contents. It would have been nice to see the volume enlarged further to include more discussion of what genethics is. I have tried to argue in this essay that genethics has a slippery subject matter best described in an expansive way that will inevitably include more than the study of segments of DNA. And many of the ethical problems that arise in the study and practice of genetics apply equally to the study and practice of education, nutrition, and socialisation. Indeed, it is in part because genes have their effects through interactions with educational, nutritional, and social regimes that the problems posed by each domain blur into each other. Genethics thus seems unlikely to be able to carve out a well defined subject matter, and it also seems unlikely that the subject matter that it does address poses any distinctive set of ethical problems. None of this renders the ethical issues arising out of the new genetics unimportant, and neither does it undo the quality of the many excellent contributions to this volume.

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