

1

'Race' as a Social Construction in Genetics

Andrew Smart, Richard Tutton, Paul Martin and George T.H. Ellison

There is an incongruity at the heart of postgenomic biomedical science. The sequencing of the human genome promised the elimination of racial and ethnic categories from biomedical science (Schwartz 2001). However, despite this, we have witnessed a resurgent interest in 'race', including challenges to the longstanding orthodoxy (following Lewontin 1972) that classifications of human populations by 'race' are not supported by genetic data (Andreasen 2000; Risch et al. 2002; Rosenberg et al. 2002; Edwards 2003). While some geneticists have consigned the concept of 'race' to the scrapheap, others appear to be reviving it. This work is occurring within a broader social and scientific landscape, one in which differences between human populations are invested (or reinvested) with significance. This attention to groups, their differences and similarities and their boundaries feeds off of, and contributes to, our ideas about identities and belonging. It has the potential to create, reinforce and/or aggravate social and ethical issues surrounding, for example, matters of self-identification, group representation, equality, stigmatization, discrimination and resource distribution. The particular discussions about 'race' in genetics which we consider in this chapter will be shown to reinvigorate debates about what 'race' really is and, by extension, claims about the status of collective or individual identities that draw upon (and reproduce) ideas relating to racial division.

A major stimulus for this kind of work is the potential development of 'targeted' diagnostic and therapeutic interventions. Such 'targeting' is predicated on the search for significant biological differences within and between 'populations', which has led to the creation of large-scale scientific projects that map genetic variation. An often-cited example is the International Human Haplotype Map (HapMap) project, which aims to improve health by charting variations in DNA sequences between population groups labelled as 'Yoruba', 'Han Chinese', 'Japanese' and 'Americans of northern and western European descent' (International HapMap Consortium 2003). It should be noted, however, that beyond such high-profile examples, genetics

researchers routinely classify samples with population labels (Ellison and Jones 2002; Fullwiley 2007; Smart et al. 2008b; Hunt and Megyesi 2008). Furthermore, as the HapMap example illustrates, we are not always confronted by the use of overtly 'racial' characteristics to label population groupings, but also other classifications that contribute to discourses of 'race' such as geography, nationality, ethnicity and/or ancestry. Indeed, genetics research often adopts classification schemes from state bureaucracies (Epstein 2007; Fullwiley 2007; Ellison et al. 2007; Smart et al. 2008b). The use of such classifications sometimes relates to the research design, although (in some jurisdictions) the state requires or encourages researchers to classify participants for reasons of monitoring policies that encourage equality and 'inclusivity' (Epstein 2007; Smart et al. 2008a).

So, what is worrisome about these routine practices in genetic research which aim to promote 'inclusive' research and may lead to potentially helpful population-specific health interventions? There is a well-documented quandary in healthcare policy and practice: categorization by 'race' and ethnicity can be simultaneously useful for addressing health inequalities and yet harmful because it reinforces the very notions that may have initially contributed to these inequalities (Witzig 1996; Nazroo 1998; Anand 1999; Bradby 2003). Furthermore, there are well-documented difficulties in operationalization and measurement (Aspinall 1997, 2001). These quandaries have resurfaced in recent debates about genetics, 'race' and medicine. Some questions have been asked about the validity, reliability and utility of socially-defined population categories as well as how clinical practice and public health advice will deal with group differences. For example, a heated debate exists around so-called 'racialized prescribing', its legitimacy, utility and social costs and benefits (Satel 2002; Burchard et al. 2003; Phimister 2003; Cooper et al. 2003; Kahn 2004; Ellison 2006). At the centre of such debates – at least for sociologists – is the question of whether genetic research will revive racial science and scientific racism (Martin et al. 2007; Rose 2007). Given that this is *genetic* research, particular concern has centred on the potential for reinvigorating the notion that 'races' are naturally occurring, biologically meaningful entities (Gannett 2004; Duster 2005).

There has been a relatively stable cross-disciplinary consensus on the ontology of 'race', described thus by Gannett: 'The apparent consensus view among academics from diverse disciplines – the humanities, the social sciences, and the biological sciences – is that biological races do not exist, at least in humans. Biological race is a socially-constructed category' (2004: 323). Nevertheless, as noted above, there have been challenges to this consensus, such that claims about the biological reality of 'race' have been resurrected (e.g., Sarich and Miele 2004). Work in genetics thus appears to threaten the common refrain that 'race' is a social construction. John Hartigan Jr. (2008) has produced the most developed account of this issue. While – as we might expect – he rebuffs the claims made about the biological basis of racial categories, he comes to a somewhat critical conclusion by arguing that:

Current assertions that race is socially constructed do important work keeping [the historical and contemporary] misuses of race in view, while

also challenging the evidentiary ground for making claims about linkages between race and genetics. The problem with this assertion, though, is that since it typically makes its starting point the discrediting of biological claims ... 'social construction' generally offers meagre guidance in comprehending the cultural dynamics at work in racial matters. (2008: 185)

To repel claims about the biological reality of 'race' by claiming instead that it is a social construction is, he argues, becoming less effective (see also Hartigan 2006).

In this chapter, we look in more detail at the appearance of the notion that 'race' is a social construction in the field of genetics. Contributors to an influential genetics journal, *Nature Genetics*, used the expressions 'socially defined construct', 'social construct' and 'socially constructed' in a Special Issue entitled *Genetics for the Human Race* (further details of which are given below). The appearance of this vocabulary initiated a debate within our research group about whether or not the use of such phrases was to be expected, what the authors meant when they used these terms and why they were using them. In order to start answering these questions, we undertook a detailed analysis of the usage of constructionist terms in the Special Issue. However, this analysis raised new questions in our minds about what it means more broadly for anyone to claim that anything is a social construction. We therefore begin by outlining three aspects of social construction that appeared to be the most relevant to our interests; these will comprise our analytical framework during the subsequent discussion.

An Analytical Framework: What Does it Mean to Say Something is a Social Construction?

There is an extensive literature on social construction spanning different disciplines, and what follows here is certainly not a review of this broad and complex idea. To gain an overview, we have relied on the work of philosopher Ian Hacking (1999). We recognize that Hacking is not the final arbiter on ideas about social construction and that some of the arguments reported below are refuted by his critics. Nevertheless, his philosophical groundwork clarifies many of the key characteristics of social constructionism.

Hacking begins by explaining how claims that something is a social construction involve challenging a notion that something is determined by 'the nature of things', thereby emphasizing that it is not inevitable but that it 'was brought into existence or shaped by social events, sources, history' (1999: 6–7). Saying that something is a social construction means uncovering contingency where none was previously thought to have existed by attending to specific social, cultural and historical contexts. Hacking then proceeds to draw attention to notable characteristics and points of difference that exist in claims that something is a social construction, three of which proved particularly useful for our analysis.

Objects, Ideas and their Interactions

Hacking (1999) explains that the sorts of things that can (and have been) described as socially constructed are extraordinarily wide-ranging. He notes that claims to social construction can be ambiguous and that 'they have in mind several interacting items' (1999: 33):

It is plain in the case of gender. What is being constructed? The idea of gendered human beings (an idea), and gendered human beings themselves (people); language; institutions; bodies. Above all, 'the experiences of being female.' (1999: 28)

His path through these ambiguities draws an analytical distinction between claims that have been attached to different things. Most importantly for our current purpose is to note his attempted division between 'ideas' and 'objects', and his argument that it is different to claim that an idea of something is a social construction than to claim that an object that is 'in the world' is a social construction (1999: 21). Nevertheless, this is a dichotomy which he acknowledges is 'fuzzy at the edges' (1999: 21), because ideas such as classifications or groupings have 'extensions – classes, sets, and groups ... [which] are collections in the world, and so count as "objects"' (1999: 22).

Hacking goes on to argue that there can be interactions between these ideas and the objects to which they refer (e.g., between a classification [idea] and the people subjected to that classification [object]). For example: 'Ways of classifying human beings interact with the human beings who are classified ... People think of themselves as a kind, perhaps, reject the classification ... Moreover, classifications do not exist only in the empty space of language but in institutions, practices, material interactions with things and other people' (1999: 31). Some classifications are thus 'interactive', that is, they involve 'conscious interactions between kind and person' (1999: 32). In such cases, he says, there is potential for 'looping effects' whereby awareness of the classification 'can have consequences for the very group, for the kind of people that is invoked' (1999: 34).

Scope and Commitment

Hacking (1999) argues that accepting one thing as a social construction does not necessitate thinking that everything else is. Thus, claims that a specific thing is a social construction can be regarded as 'local' while, in contrast, 'universal' constructionism would be the claim 'that every object whatsoever' is socially constructed (1999: 24). However, Hacking questions whether such an extreme universal position has ever really been advocated. He argues that the primary use of labelling something as a social construction is to raise consciousness about social, cultural and historical contingency in ways that undercut assumptions about inevitability. Consequently, he says, such claims are often (but not always or necessarily) seen to offer a potential for liberation and are accompanied by arguments about value judgments and the need for change. He proceeds to outline six 'grades of commitment' to social constructionism – these are labelled as historical, ironic, reformist, unmasking, rebellious and revolutionary –

which range from merely having a particular attitude to scholarly activity through to using it as the basis for a form of political activism (1999: 19).

'Social' versus ...

Some claims about social construction are framed in oppositional terms. Certain things are argued to be either social constructions or 'real', 'biological' or 'natural'. Much of the furore surrounding social construction can be traced back to the suggestion, or implication, that the things that natural scientists studied, how they studied them and the outcomes of their studies were not inevitable. Hacking explains that the 'science wars' debates were 'heavily loaded with the words [objective, ideological, factual and real]' (1999: 23). For him, an opposition between things that are real and things that are social constructs is not always necessary; certain things can be both (1999: 29, 101). He also argues that under certain circumstances things (such as certain mental illnesses) can be both social constructions and biological or natural 'kinds' (1999: 119–24).

Our Analytical Frame and the Social Construction of 'Race'

Hacking (1999: 16) only briefly examines 'race' as a social construction to illustrate how the function of such claims is to undercut ideas that 'one's race is a part of one's "essence"'. He returns to the subject of 'race' elsewhere, when he argues for the continuing relevance of 'the category of race' because 'races in some contexts are not only statistically significant but also statistically useful' (2005: 108) and when he describes the quandaries that arise from contemporary genetic research (2006). However, our purpose here is not to review Hacking's views on 'race', but rather to highlight aspects of his general discussion of social construction which we found useful for analysing the Special Issue. To recap, these were: differences in respect to the focus of claims, including the interactions between 'ideas' and 'objects'; differences in respect to the scope of, and commitment to, claims; and the (oppositional) form of some claims. For now, three initial thoughts can be noted about how these general ideas concerning social construction relate to 'race' in the context of genetic research.

First, to claim that 'race' is a social construction can hide great complexity and diversity (in focus, scope, commitment, etc.). This implies not just potential differences in usage between people, or within and across disciplines and subdisciplines, but also that different meanings can be implied or read into what – on the surface – seems like a simple statement. Secondly, ideas about 'interactive classifications', 'looping effects' and fuzzy boundaries between objects and ideas are all pertinent for thinking about 'race' as a classification of humankind. These underline that when we talk about 'races' in humanity, we engage in debates about identity politics, which frequently (but not exclusively) invoke a long and sometimes brutal history of discrimination and stigmatization. Thirdly, claims that something is a social construction rather than 'real', 'biological' or 'natural' are particularly relevant to debates about 'race', which often follow this pattern. We will return to these issues in our discussion.

Social Construction in the Special Issue of *Nature Genetics*

Our analysis of the appearance of the notion that 'race' is a social construction in 'genetics' centres on the November 2004 Special Issue of *Nature Genetics*, titled *Genetics for the Human Race*.¹ We acknowledge from the outset that this is a somewhat narrow 'sample' of perspectives from 'genetics' and, had our approach been different, we may have found additional and alternative views. Nonetheless, our aim is to be exploratory and discursive rather than strictly empirical. In this section we provide further details about the Special Issue and describe the range of positions that were evident in respect to the notion that 'race' is a social construction. We make some analytical comments as we reveal the position of each set of authors, but a more comparative analysis will follow in the section of this chapter titled Discussion.

Background: The Special Issue

Our analysis of the Special Issue *Genetics for the Human Race* reflects its importance as a landmark publication in debates about 'race' and genetics, a significance also recognized by other discussions of this field (Hacking 2005, 2006; Rose 2007; Hartigan 2008). It garners such attention because *Nature Genetics* is a high-status academic journal and the contributors to the Special Issue are well-recognized figures in the debate. The discussions that are published reveal not only the ongoing quandaries about 'race' and genetics but also the importance of the topic for leading scientific figures (including Francis Collins, the Director of the United States National Institute of Health) and the field of genetics more generally. Nevertheless, the Special Issue should be recognized as existing within a history of interest about population classifications in *Nature Genetics*. It pursued a number of themes raised in previous *Nature Genetics* editorials (2000, 2001 and 2004a), such as: how 'race' and ethnicity should be defined, classified and operationalized; the value of alternative concepts (like ancestry); and the importance of public engagement on this topic.

The Special Issue originated from a workshop, 'Human Genome Variation and "Race"', held on 15 May 2003 at the National Human Genome Center (NHGC), Howard University, Washington DC. Howard University has historical links to Black politics in the U.S.A., something which is reflected in the aims of the Centre. The NHGC is 'dedicated to the engagement of African Americans and other people of African ancestry into the mainstream of human genome research', which has led to criticism that 'the center perpetuates race-based science and medicine' (Royal and Dunston 2004: S6). The workshop brought together contemporary research on the relationship between 'race' and genetic variation, and a range of views on the social and ethical implications of this research. It focused on the following questions: 'What does the current body of scientific information say about the connections among race, ethnicity, genetics and health? What remains unknown? What additional research is needed? How can this information be applied to benefit human health? How might this information be applied in non-medical settings? How can we adopt policies that will achieve beneficial societal outcomes?' (Patrinos 2004: S1) The subsequent Special Issue comprised twelve papers: a sponsor's foreword, written by the Director of Biological and Environmental Research at the United States Department of

Energy, an editorial, three ‘commentaries’ and seven ‘perspectives’. In the editorial it is stated that ‘it is time to engage everyone in this discussion’ (Nature Genetics Editorial 2004b: S3) and the interdisciplinarity of genomics as a field of enquiry was somewhat evident in the Special Issue, which included contributions from anthropologists, bioethicists and geneticists.

Elsewhere, we have argued that two broad strategies emerged from contributions to the Special Issue in respect to ‘enabling’ continuing scientific work in this area. These were to examine links between ‘race’ and genetic variation while awaiting the development of alternative ways to subdivide populations that are more relevant to genetics, and to investigate genetic variance in populations classified using alternative categories and labels, thereby avoiding the terminology of ‘race’ (Smart et al. 2006).

Social Construction in the Special Issue and our Initial Thinking

The term ‘construct’ (or the derivatives: ‘constructs’, ‘constructed’ or ‘construction’) is used in relation to ‘race’ on eleven occasions, in four articles out of a possible twelve. As noted earlier, the appearance of these phrases initiated a debate within our research group. One member argued that it was surprising that any articles published in such a prestigious natural science journal would have engaged at all with a notion derived from the social sciences. Indeed, a keyword search reveals that *Nature Genetics* has only ever published three other items in which the term ‘social construction’ appears (one of which was an aforementioned editorial). Another suggested, however, that he would have expected that more of the articles in a Special Issue adopting an explicitly reflective stance on the biological basis of ‘race’ would have engaged with the notion of social construction. Surprising or not, the appearance of these terms appeared to signal that the politics of ‘race’ and social science debates had infiltrated natural science writing.

Nevertheless, some limitations to the impact of the notion that ‘race’ is a social construction should be noted at the outset. The authorships in three of the four papers were – in some respects – overlapping. Charles Rotimi, who authored a ‘perspective’, and Charmaine Royal and Georgia Dunston, who coauthored a ‘commentary’, were all also coauthors on the ‘perspective’ by Keita et al. (2004). These authors are ‘linked’ by their affiliation to the NHGC. This indicates that the notion was less widespread than would have been the case if the papers had been authored discretely. Furthermore, three of the four articles using the phrases, while only two of the eight articles that did not, were coauthored by anthropologists and/or bioethicists. This perhaps signals the influence of interdisciplinarity on the spread of the idea that ‘race’ is a social construction, but again this raises a question mark over our initial thinking that it is being adopted by the field of genetics.

Framing and Usage of the Terms

To begin a more detailed analysis of what the authors meant when they used constructionist terms, we first introduce the ways in which the notion that ‘race’ is a social construction was framed and used by the four sets of authors.

In the first 'commentary' paper, Royal and Dunston (2004) set out an overview of the Special Issue and its context, and in doing so make a number of statements about 'race' as a construct. They argue that knowledge about 'human genome variation is forcing a paradigm shift in thinking about the construct of "race"' leading to the questioning of 'paradigms of human identity based on "races" as biological constructs' (2004: S5). They align themselves to the position of their research centre, the NHGC, which they describe thus: "Traditional "racial" designations in humans are not bounded, discrete categories but are fluid, socially defined constructs that have some poorly understood correlations with various biological elements and health outcomes' (2004: S5–6). Royal and Dunston's opening overview to the Special Issue thus highlights that the notion of "races" as biological constructs' feeds into the ways in which people form and/or express their sense of identity. They also adopt a position which focuses on 'traditional "racial" designations' – i.e., not 'race' per se, but on potentially anachronistic 'racial' labels and descriptions.

Keita et al. (2004), the first of three 'perspective' papers which use the notion of social construction, is described as 'putting forward the NHGC's position on the meaning and application of the term "race"' (Royal and Dunston 2004: S6). This position is that 'race' is a 'legitimate taxonomic concept that works for chimpanzees but does not apply to humans (at this time)' (Keita et al. 2004: S19). They recommend that alternative population labels be used and argue that this would improve research designs and public policy. Nevertheless, Keita et al. (2004: S18) assert that their "no biological race" position does not exclude the idea that racism is a problem that needs to be addressed'. Of the four papers that use the notion of social construction, Keita et al. (2004) gives the most (and the most explicit) consideration to what it might mean. We will consider their ideas in more detail below, but at this point it is sufficient to note that they begin their paper thus: '[t]he term "race" engenders much discussion, with little agreement between those who claim that "races" are real (meaning natural) biological entities and those who maintain that they are socially constructed' (2004: S17). From this we can note initially that for Keita et al. (2004), 'races' are 'entities' rather than constructs (perhaps implying that they are things that exist rather than things that are simply ideas). Furthermore, they contrast socially constructed entities with 'biological' ones – the latter being seen as 'real (meaning natural)'. As we will discuss later, this problematically implies that the former are unreal or unnatural.

Mountain and Risch (2004) offer a 'perspective' paper which argues that 'racial' categories remain useful to biomedical research. Like Keita et al. (2004), they use disagreements about the status of 'race' as a construction in the opening context of their paper. The authors discuss the revival of debates about the 'biological or genetic basis of "race" or "racial" differences' by claiming that '[t]he controversy stems, at least in part, from the possibility that attitudes are influenced by whether people believe "race" is a biological or social construct' (2004: S48). For Mountain and Risch, whether 'race' is viewed as a 'biological or social construct' is a matter of belief, and it is this conceptual aspect that they claim plays a key role in determining people's attitudes and practices. While this is the only appearance of construction in

the paper, Mountain and Risch arguably delve deeper into the notion than the other papers described here when they attempt to define a social category or group. We will consider this attempt in more detail below.

In his paper, Charles Rotimi (2004) describes the challenges surrounding the design of the HapMap project to illustrate the complexities and ambiguities associated with the use of group labels in genomic research. Rotimi (2004: S44) recognizes the possibility that data from the HapMap could become embroiled in ‘emotional and volatile issues surrounding group identity’. He introduces social construction when quoting Morris Foster’s argument that concerns about the HapMap form part of wider discussions about ‘the implications of using socially constructed identities in genetic research’. He later goes on to reveal that scientists using HapMap data ‘are advised to present their data in ways that avoid ... attaching inappropriate levels of biological importance to largely social constructs such as race’ (2004: S44). For Rotimi, ‘race’ is a construct, but one which is ‘largely social’ and in danger of being invested with ‘inappropriate levels of biological importance’. In his portrayal, ‘race’ manifests as a blend of social and biological criteria rather than one or the other – although this apparent compromise leaves a number of questions unanswered about the relative contribution of social and biological components, and their functional/causal interrelationships, which we shall return to in the Discussion section of this chapter.

This brief introduction to the four papers highlights a common framework of terminology, including notions of social construction, the ‘biological’ and the ‘social’. There is nevertheless already evidence of differences in how these authors describe the notion that ‘race’ is a social construction. We will now undertake a closer examination to highlight some subtle variations in focus and conceptualization.

Three Subtle Variations in Meaning and their Implications

Using further extracts from the Special Issue, we can reveal that differences exist between authors in terms of what social construction means to them and in terms of what it is about ‘race’ that is socially constructed. These variations in the meaning of the notion that ‘race’ is a social construction are shown to have implications in terms of their conceptual or methodological approach.

Socially Constructed ‘Race’ as the Product of Social Negotiation

One meaning of the notion that ‘race’ is a social construction is that the membership of a ‘race’ category or group is the result of social decisions. This position is argued by Mountain and Risch (2004) in their attempt to provide a conceptual grounding for the ‘social’ character of groups and categories. They argue: ‘we define a social category or group as one determined by social factors; an individual is associated with such a category (or categories) based on a set of socially negotiated criteria. Given this definition, “race” and “ethnicity” are social categories, even when some inclusion criteria may be biological’ (2004: S48).

So, a group or category is social if ‘a set of socially negotiated criteria’ is used to make a decision about membership, even when some of the criteria involved in these

decisions are biological. For Mountain and Risch (2004), the key to determining whether a group or category is a social construct lies in whether there has been some social negotiation of the criteria that are used to determine whether or not people are part of the group or category. Thus, they argue, 'racial' and 'ethnic' groups and categories are social constructs because social negotiations have been required to determine the criteria that are used to judge who is associated with which groups and categories.

We will analyse this meaning of social construction alongside the two others that follow in the section of this chapter titled Discussion, but in the meantime it can be noted that the very processes of creating groups or categories, and negotiating criteria for inclusion or exclusion, is a human activity (even when this occurs under the auspices of 'science'). If this argument is applied to Mountain and Risch's (2004) definition, it becomes hard to think of any group or category that is not social.

Socially Constructed 'Race' as the Societal (Mis)Adoption of a Scientific Concept

A second meaning of the notion that 'race' is a social construction is apparent in the analytic work of Keita et al. (2004), as they attempt to disentangle 'correct' and 'incorrect' usages of the word 'race'. To locate their consideration of social construction within the broad sweep of political history and the adoption of scientific 'racial' classification schemes into social institutions, policies and practices, they argue that:

some of the 'racial' taxa of earlier European science used by law and politics were converted into social identities. For example, the self-defined identities of enslaved Africans were replaced with the singular 'Negro' or 'black', and Europeans became 'Caucasian', thus creating identities based on physical traits rather than on history and cultural tradition. Another example of social construction is seen in the laws of various countries that assigned 'race' (actually social group or position) based on the proportion of particular ancestries held by an individual. The entities resulting from these political machinations have nothing to do with the substructuring of the species by evolutionary mechanisms. (2004: S18)

According to this characterization, socially constructed 'race' can be traced back to artefacts such as legal and political classification schemes and the political and social processes by which the categories and labels within those schemes became adopted by people as group identities. Such an argument is a common constructionist position on 'race'. What is notable, however, is their attempt to wholly dissociate these 'political machinations' from scientific definitions and interests (an issue to which we will return in the section of this chapter titled Discussion).

This dissociation is accompanied by the designation of some uses of the term 'race' as incorrect. They conclude that "[r]ace" denotes socially constructed units as a function of the incorrect usage of the term' and argue that "Race" is "socially constructed" when the word is incorrectly used as the covering term for social or

demographic groups. Broadly designated groups, such as “Hispanic” or “European American” do not meet the classical or phylogenetic criteria for subspecies or the criterion for a breeding population’ (2004: S18).

Thus, for Keita et al., the term ‘race’ is either used correctly according to its scientific definition (as a ‘natural’ biological entity/category resulting from the ‘substructuring of the species by evolutionary mechanisms’) or it is misused in other areas of social life and is, in the process, socially constructed. Furthermore, it is ‘social or demographic groups’ or ‘positions’ that are ‘socially constructed units’, while ‘race’ only becomes socially constructed when it is (in their view) misused to define these ‘groups’, ‘positions’ or ‘units’.

Again, we will analyse this position further in the Discussion section of this chapter, but in the meantime it is worth noting that this is a standpoint which (like the previous example from Mountain and Risch) appears to ‘bracket off’ the social actions and interactions that constitute scientific activity.

Socially Constructed ‘Race’ as a Critique of Scientific Categorization

A third meaning for the notion that ‘race’ is a social construction was its use as a way of critiquing the ostensibly ‘scientific’ categories used to describe and understand ‘races’ in humanity. This usage was apparent in Royal and Dunston’s (2004) ‘commentary’ when they shift the focus of the construction claim to ‘traditional “racial” designations’. Their reference to designations draws attention away from ‘race’ itself and towards the names, labels and descriptions associated with ‘racial’ groups. Furthermore, their use of the term ‘traditional’ locates these designations firmly as the products of human history and past classification processes. It is a little unclear from the paper itself, but we could speculate that Royal and Dunston (2004) call these designations ‘socially defined constructs’ because either they were (at least in part) defined using ‘social’ criteria and/or they were (at least in part) developed as a result of human actions and interactions.

Crucially, Royal and Dunston (2004) emphasize that ‘racial’ designations are ‘fluid, socially defined constructs’ as opposed to ‘discrete categories’. Their adoption of this oppositional framing (fluid versus discrete) alludes to the problematic use of social entities or social processes in the production of what have sometimes been (and in some instances continue to be) treated as ‘objective’ and ‘natural’ scientific categories. Indeed, Royal and Dunston (2004: S5) call for people, including natural scientists, to be wary of and not be misled by such classifications when they note that genomics raises ‘questions about the validity of inferences made about “race” in the biomedical and scientific literature’.

A Consensus on ‘Race’?

Before reflecting on the differences in the usage of the notion that ‘race’ is a social construction, it is important to review the broader position that these four sets of authors adopted towards ‘race’ as a concept for understanding human health. All of the papers we considered from the Special Issue adopted a critical stance towards its validity and reliability as a proxy for health-related research. Indeed, as Royal and

Dunston conclude, in the Special Issue as a whole, 'there seems to a consensus that "race", whether imposed or self-identified, is a weak surrogate for various genetic and non-genetic factors in correlations with health status' (2004: S7). For example, from the papers we have been considering, Mountain and Risch (2004: S52) report on the limitations of 'racial' and 'ethnic' categories as 'proxies for a wide range of factors, potentially genetic and nongenetic', and we have just noted Royal and Dunston's (2004) own reservations about the validity of inferences made about 'race'.

However, the thorny question of whether or not 'racial' classifications should continue to be used remains contested. Rotimi (2004: S44) argues that it is time to move beyond 'poorly defined social proxies of genetic relatedness like "race"' and, as we have noted, Keita et al. (2004) argue for alternative population labels. In contrast, Mountain and Risch (2004) argue for the ongoing utility of 'racial' and 'ethnic' categories in epidemiology and clinical practice. Nevertheless, they recognize their 'potential for furthering racism' and assert that their continuing use is a temporary measure which is justified because of health disparities (2004: S52).

In this section we have provided a largely descriptive account about the positions of the various sets of authors. We will now explore further the important analytical issues to which we have alluded.

Discussion: Variations in Meaning and Interpretation

Earlier in the chapter we drew attention to three aspects of claims about social construction: differences in respect to the focus of claims, including the interactions between 'ideas' and 'objects'; the scope of, and commitment to, claims; and the oppositional form of some claims. We will now return to these three themes and will use them as a broad framework for exploring what the authors in the Special Issue meant when they invoked the notion that 'race' is a social construction, and why they were using this. In doing this we will also consider implications for issues surrounding social identity. In each subsection we will compare and contrast the various contributions to the Special Issue and consider other academic work in the field.

Objects, Ideas and their Interaction

When a claim to social construction is made, Hacking (1999) asks 'what' precisely is it that someone is claiming to be socially constructed? In the Special Issue there was extensive variation in the 'what' that the authors claimed to be socially constructed: an object or idea called 'race' that was thought to be socially and/or biologically constituted; 'race' as it is manifested by the designations used to classify and categorize these objects or ideas; 'race' as a scientific concept that was sullied by sociopolitical misuse; the physical manifestations associated with the idea of 'race'; or the social institutions, processes, relations, actions, experiences or meanings that might be 'ordered' by the idea of 'race'. There were specific attempts to focus attention on different aspects of 'race', for example, Royal and Dunston's (2004) attention to the idea of 'racial designations' or Keita et al.'s (2004) attempt to disentangle legitimate and illegitimate uses of the concept. In contrast, Mountain and Risch's (2004)

attempted conceptualization of ‘a social category or group’ does not discern between objects and ideas. In our attempt to discern what the authors meant when claiming that ‘race’ is a social construction, part of the answer is that the ‘race’ to which they were referring was not a consistent or ‘fixed’ thing.

There is only limited evidence in the Special Issue of the authors attending to the interaction between ‘race’ classifications and the people who have been classified. There is some attention to historical political contexts (Keita et al. 2004), including the notion of ‘traditional “racial” designations’ being anachronistic (Royal and Dunston 2004), and the issue of continuing health disparities does appear in every article. Of course, the interaction between ‘racial’ classifications and people is particularly significant as it is the basis on which ideologies of racism were founded and flourished. It is thus notable that while two of the papers express concerns about racism (Keita et al. 2004; Mountain and Risch 2004), the particular ways in which genetic research using ‘racial’ categories might contribute to racism is not meaningfully discussed.

If we turn to the implications for individual and collective identity of using ‘race’ in genetics research, it is the ‘looping effects’ (Hacking 1999) that are a particular area of concern. As we noted in the introduction, fears about genetics reinvesting ‘race’ with biological meaning have been prominent in the debate (Gannett 2004; Duster 2005; Martin et al. 2007). However, some social scientists have argued that genetics has also been mobilized in increasingly creative ways that seek to undermine and disturb simplistic racial dichotomies and in ways that can be seen as both empowering and disempowering to specific ‘racial’ or ‘ethnic’ groups. Campbell (2007a: 184), for example, discusses ambivalence in U.K. press stories that addressed ‘race’, nation and genetics, claiming that ‘genetic information is used in a creative politics of identity’, but that it is valuable both to claims of ‘bounded lines of singularity’ and the ‘historical realities of intermixture’. Rose argues that the ‘molecular biopolitics of race’ (2007: 186) should be located in its contemporary context of ‘an age of choice and self-maximisation in which the body and its capacities have become central to technologies of selfhood’ (2007: 8). He uncompromisingly claims that ‘what is at stake in these arguments about human genome variations among populations is not the resurgence of racism, the spectre of stigmatization, a revival of biological reductionism, or the legitimation of discrimination: it is the changing ways in which we are coming to understand individual and collective human identities in the age of genomic medicine’ (2007: 185). Furthermore, as Fullwiley (2008) attests, the personal identity politics of the scientists she studied can be used to frame their work as being committed to inclusivity and the reduction of health disparities, rather than being motivated by racist ideas about human difference.

Nevertheless, it has been shown that there has been a convergence between the racial/ethnic categories that are used in genetics research and those employed by the agencies of state bureaucracy (Epstein 2007; Fullwiley 2007; Ellison et al. 2007; Smart et al. 2008b). This is particularly significant because science and state bureaucracy are recognized as exerting particular authority in processes of ‘social categorization’ and ‘group identification’ that together contribute to identity formation (Jenkins 1996:

89). If the combined authority of state bureaucracy and genetic science becomes aligned behind a conceptualization of 'race' as socially constructed (see also Hartigan 2008), then the reasons for and implications of this should be considered most carefully. For example, in another field of biotechnology, Campbell (2007b: 95), reveals the racialized aspects of 'gamete-matching' in assisted reproduction, whereby regulations state that 'donated gametes should match the physical characteristics of the recipients'. The U.K., Spain and Norway, he explains, have different regulatory regimes, but all three, 'explicitly, or by implication, prevent clinically assisted cross-"racial" mixing' (2007a: 113). Such practices, he argues, can be distinguished from historical racialized hierarchies, but nonetheless demonstrate 'a tenacity of sensibilities over race and reproduction, and the power that "racial" mobility is deemed to hold' (2007a: 116).

Scope/Commitment

As we have reported, all of the papers we have considered from the Special Issue adopted a critical stance towards 'race' as a concept for understanding human health. When treating the Special Issue as a whole, however, the impact of the social construction of 'race' is somewhat superficial. It mostly appeared in passing as a descriptor, for example, when it was used to allude to a broader unresolved debate about the status of the 'race' concept (Mountain and Risch 2004; Keita et al. 2004) or when it featured as part of a quotation (Rotimi 2004) or the 'position' of the NHGC (Royal and Dunston 2004). On the surface, Keita et al. (2004) appear to be the most committed constructionists, as they present the only overt expressions of the cultural, political and historical contingency of human 'races', reject the (current) existence of human 'races' and argue for using population labels other than 'race'. We argue, however, that theirs is a shallow commitment to the idea of social construction.

We noted above that both Mountain and Risch (2004) and Keita et al. (2004) appear to 'bracket off' scientific activity from the realm of social construction. In respect to arguments about 'race', this could be a problematic partition to make. For example, a distinction between correct 'race' in science and erroneous socially constructed 'race' would hamper critical examination of the 'race' concept as developed and used in past and contemporary scientific attempts to understand human diversity. This parsing of scientific 'race' from 'race' in society also leaves room for the highly contentious claim that there is a natural or biological basis to human 'races' situated within our evolutionary history (Ellison and Jones 2002). Indeed, Keita et al. (2004) qualify their commitment to the inapplicability of taxonomies of 'race' to humans with the parenthesis '(at this time)'. An important caveat to our analysis, however, is that Keita has previously argued that the 'classical race concept' is intertwined with its meanings and uses in society and has been critical of the idea of 'core populations' (Keita and Kittles 1997: 534–35). The multi-authored composition of the paper in the Special Issue, as a position statement from the NHGC, obviously signals multiple 'voices' and leaves open deeper questions about

the processes by which the consensus position was reached, and indeed the meaning of the potentially contentious qualification ‘at this time’.

Notwithstanding these unknowns, deliberately leaving open the possibility of historical (or future?) human ‘races’ has implications for thinking about intersections with social identity. The existence of ‘core populations’ or ‘true originals’ (Keita and Kittles 1997: 535–36) creates the potential for contemporary individual or collective identity associations to those ‘races’. Of course, we do not have to look too far back into history to encounter the destructive possibilities of the idea of historically ‘pure’ races (Kevles 1985). However, as was noted above in relation to fears about the revival of scientific racism, a position has been proposed which allows for greater flexibility in the ways in which genetic information is adopted and made meaningful as an aspect of social identity (Gilroy 2000). For example, Bliss (2008: 82) argues that genomic technologies of ‘ancestry mapping’ have entered the public consciousness and ‘the laity has responded with new ways of conceptualizing human origins, personal identity and the self, for example, media accounts that use genetic genealogy to construct personal narratives. Nelson’s (2008) ethnographic work with consumers of ancestry tests details the diverse interpretations, responses and ‘self-fashioning’ that can accompany testing, which transform understandings of ‘race’ and ethnicity.

The theme of scope/commitment also draws us back to our question about why these sets of authors in the Special Issue used the notion that ‘race’ is a social construction. The pattern of the appearance of social construction in the Special Issue is partially explained by interdisciplinarity in genomics research and the politicization of ‘race’. As we have seen, a number of the authors had institutional allegiance to the NHGC – an interdisciplinary institution which effectively defines itself in terms of the politicization of ‘race’. We can nevertheless speculate a little further on why these authors were using this notion.

Hartigan (2008) provides an insightful, if somewhat instrumentalist, account as to why some geneticists who investigate ‘race’ use ideas about social construction in their work (including some of those discussed in this chapter). He partially attributes this to a reliance on the sociocultural definitions of ‘race’ that are adopted from state bureaucracy, but he also develops his argument into an ‘interests analysis’. He argues that this alignment not only allows scientists to link their activities to those outside of the laboratory (i.e., to policy and to healthcare), but that it also has a disarming effect because it ‘invokes what critics “already” know’ (2008: 183). This is acceptable, even preferable, for these scientists to the extent that the ‘connection to the “social” does not compromise the scientific status of their claims ... regarding the performance of genes’ (2008: 172–73) or hinder their goals. What is given less attention by Hartigan (2008), however, is the more immediate sense of motive, including the ‘face value’ possibility that scientists may actually be wrestling with the notion that ‘race’ is a social construction because engaging with the concept may give them some analytical purchase on their subject matter.

While there are places in the Special Issue where the notion that ‘race’ is a social construction is used in a superficial manner, a positive sense of engagement was

evident in at least some of the papers we have considered (even if we are critical in our assessment of their efforts). Furthermore, all of the papers we considered adopted a critical stance towards 'race' as a concept for understanding human health. We agree with Hartigan (2008) that the notion of social construction offers 'meagre guidance'; however, it seems to us that this makes it all the more likely that those working in the field will seek to understand and employ this notion. While Hartigan's (2008) analysis emphasizes that the scientists do this in ways that best serve (or least damage) their goals and research agendas, this seems to underplay the possibility that in practice this is a process that may actually enhance analytical clarity. This said, however, we are not naïve to the potential outcomes of genetic science adopting the notion that 'race' is a social construction into its toolkit of ideas or lexicon. If used in a superficial or uncritical manner, it could represent simply a more subtle but equally pernicious example of how unstable and fluid identities can be presented as if they are solid and fixed (if not 'real' and 'natural').

Hartigan (2008) goes on to formulate scientists' motives as part of a contest between analytical domains over the right to speak about 'race'. Indeed, Keita et al.'s (2004) argument in the Special Issue that the misappropriated 'race' of popular discourse is a social construction can also be interpreted using such an analysis, as a kind of boundary device that attempts to demarcate the legitimate scope and subjects of scientific enquiry (Gieryn 1983). There is rhetorical value in claiming that something is 'real'/'biological'/'natural' or that it is socially constructed. As such, when people make arguments that position 'race' as either socially constructed or 'real'/'biological'/'natural' (or indeed some blend thereof), these could actually reflect value judgments about what is important, knowable and/or worthy of study, or could be viewed as attempts to establish boundaries which enable them to position their claims and entitle them to 'speak' authoritatively.

Oppositional Form

As Hacking's (1999) analytical framing predicted, the notion that the 'social' exists in opposition to things that are 'real', 'biological' and/or 'natural' was somewhat evident in this selection of articles, particularly when social construction was referred to 'superficially' or in passing. There was, however, also some evidence of 'blurriness' in these boundaries. Mountain and Risch (2004), for example, defined 'social' groups in a way that appears to mark them out as naturally occurring. Rotimi (2004: S44) termed 'race' a 'largely social construct', although, as we have noted, this conceptualization leaves a number of questions unanswered. We will now further explore these boundary issues.

We noted above that Keita et al.'s (2004) distinction between 'race' as 'real' or 'race' as 'socially constructed', which makes socially constructed race 'not real', is a difficult distinction to support. Sociological accounts consistently emphasize that 'race' has 'real' consequences, in that it clearly has 'meaning' and 'effects'. Nevertheless, there are divergences within sociology about the ontology of 'race', to the extent that some have reached the conclusion that 'there are no races, biological or social' (Mason 2000: 8). This rejection of what might be termed social 'race' is founded on

concerns about reification and the appropriate analytical focus of sociology (Solomos 2003). Instead, attention is focused on the processes through which social relations are structured by ideas (or ideologies) that uphold perceptions of meaningful racial differences, such as racialization and/or racism (Miles 1982, 1989; Omi and Winant 1986). In respect to our current discussion, this sociological work has at least two implications. First, it serves as a warning: simply claiming that ‘race’ is a social construction in genetics research does not mean that the work will not contribute to the reification of ‘race’. Secondly, uncritical adoption of the notion of ‘race’ as a social construction could miss the significant ways in which processes of racialization and/or racism are influences on the kinds of population differences that geneticists are interested in studying (Duster 2005). This means that the scientific concept of ‘race’ cannot be easily partitioned from the identity politics that are associated with it. Furthermore, these identity politics have implications for the central concerns in this field of biomedical science – patterns of health and reproduction.

These are exactly the kinds of ‘looping effects’ to which Hacking (1999) draws our attention. It is possible to see this interaction of ‘objects’ and ‘ideas’ at the heart of the repeated scientific struggles to disentangle the ‘social’ and the ‘biological’ in the conceptualization of ‘race’. Ellison and Jones (2002) argue that these attempts at disentanglement are forever complicated by the fact that social processes actually result in the differential allocation of genetic diversity. They explain that the act of classification inevitably results in the disproportionate allocation of some genetic traits to different groups (however these are classified); yet, importantly for this discussion, this disproportionate allocation is exacerbated when the principal classificatory characteristics stem from, and have a bearing on, assortative mating. This includes aspects of appearance, geographical origins and/or sociocultural affiliations, which are the characteristics underpinning traditional and contemporary classifications of ‘race’ (and related concepts such as ethnicity). Hartigan (2008) reaches a similar conclusion after critiquing the attempts of genetic scientists (such as Risch) to delineate the realm of genetics in terms of ‘mating patterns’. He underscores the depth of the impact of ‘culture’ on ‘genetics’ by arguing that ‘there are few matters more influenced by cultural rules, practices and beliefs than how people decide whether or with whom to mate’ (2008: 184).

Indeed, the very ground on which debates about ‘race’ have traditionally been fought has itself been shaken by arguments about the ‘destabilization of “nature”’ which simultaneously unsettle the concept of ‘the social’ (e.g., Wade 2007). When the notion of ‘race’ is applied to humanity, there is a blurring of, and interaction between, things that may have once been distinguished as ‘the social world’ or ‘the natural world’. In recent anthropological discussions of ‘race’ in transnational adoption, for example, it has been argued that nature and culture are interwoven or blurred (Marre 2007), or that there is a continuum of nature-culture (Howell and Melhuus 2007). If ‘race’ in popular discourses of identity and belonging blurs the lines between the social and the biological, and if genetic science looks likely to continue struggling to effectively tease them apart, we might ask what is the way forward?

Ideas about 'feedback loops and interaction effect' between social and biological realms are highlighted by Duster (2005: 1050) and have been discussed in bioethics, sociology and epidemiology (see Fullwiley 2008: 723). For example, in reviewing putative racial differences in bone density, Fausto-Sterling has argued for a reconceptualization of the underlying nature-culture dichotomy using a model in which 'the social produces the biological in a system of constant feedback between body and social experience' (2008: 658). Fausto-Sterling draws particularly on the argument championed by Nancy Krieger that humans are both biological and social creatures. She quotes Krieger's (2005: 2) argument that humans 'literally embody – via processes which necessarily involve gene expression – the dynamic social, material, and ecological contexts into which we are born, develop, interact, and endeavor to live meaningful lives' (cited in Fausto-Sterling 2008: 676).

These notions of 'embodiment' have been applied to discussions about 'race'. Wade (2004), for example, explains how life in racialized social environments inscribes 'race' on the body, using illustrations about hypertension and sport. In these examples, physical differences actually result from social settings in which processes of racialization structure experiences and outcomes. Moreover, the biological consequences of racialized social relationship become easily misconstrued as further evidence of the biological underpinning of racial difference. Wade (2004) uses theories of embodiment to explain these processes and their contribution to the endurance of 'race' in human imaginations. Nevertheless, it is also possible to interpret these processes using Hacking's notion of a 'looping effect' between ideas (the categories) and objects (the categorized). We might add that in this case the 'looping' changes the object in ways that make it better fit the idea. A racialized narrative of human biological difference can, it seems, be a self-fulfilling prophesy.

After adopting an embodiment model in her study of bone density, Fausto-Sterling (2008) concludes that where differences in health outcomes are attributed to 'race', it is necessary to begin a search for the reasons among its numerous potential (and intersecting) social, cultural and biological correlates, and that it should be incumbent upon researchers to carefully define and defend their categorizations. Similar conclusions have been reached previously, however, and it has been stipulated in high-profile biomedical science journals that whenever 'race' or ethnicity are employed as categorizations, they should be tightly defined and justified according to the context in hand (e.g., *British Medical Journal* 1996; *Nature Genetics* Editorial 2000; see also Freeman 1998; Kaplan and Bennett 2003; Outram and Ellison 2006; Smart et al. 2008b). The extent to which such guidelines are followed, or can be followed, has nevertheless been held open to question (Bhopal 1997; Ellison and Rosato 2002; Sankar and Cho 2002). As such, it is now important to explore how (or if) concepts such as embodiment would help to encourage a more routinely critical stance towards 'race' in genetics and biomedical science that could be realized in working practice.

Conclusion

Prior to his article on ‘race’ in medical genetics, Hartigan (2006: 8) had argued that it is ‘not enough’ to claim that ‘race’ is socially constructed. This is partially because he thinks that it leads ‘directly to claims that race is really just a “myth”, a form of false consciousness, or that it is entirely a function of racism’, and these ideas sit uncomfortably alongside what he refers to as “peoples” deeply engrained sensibility that race is actually very real and palpable, something that they both experience and can “see” (ibid.) While the usage of the notion of social construction in the Special Issue may not necessarily invoke ideas that ‘race’ is a myth, false consciousness or a product of racism in this ‘direct’ manner, the divergent usages of the notion aptly illustrate the competing dynamics to which Hartigan refers.

Sociological accounts offer some insights into these dynamics by attending to the processes by which ‘race’ becomes socially meaningful and, as we have seen, a number of authors have considered the possible impacts of genetics on such processes. Cornell and Hartmann succinctly explain that the processes of creating ‘races’ have involved human choices about characteristics, categorizations, assignment of meaning and courses of action:

We decide that certain physical characteristics – usually skin colour but perhaps also hair type, stature, or other bodily features – will be primary markers of group boundaries. We invent categories or persons marked by those characteristics. The categories become socially significant to the extent that we use them to organise individual and collective action. In other words, the categories become important only when we decide they have particular meanings and act on those meanings. (2007: 27)

As we have shown, debates about ‘race’ and genetics certainly touch upon the assignment of meaning and courses of action that follow. Concerns about the potential for genetics to (re)invigorate racialized worldviews have been counterpointed by suggestions that ‘race’ and genetics interact in ways that are somewhat fluid, flexible and novel. Discussions of identity politics relating to ‘race’ in genetics – at least those reviewed in this chapter – have thus been cast as aspects of racialization/racism and/or as expressions of ‘consumption-oriented economies of difference, choice and malleable body image’ (Campbell 2007b: 101).

It is perhaps appropriate to conclude by turning to the other aspects of construction processes outlined by Cornell and Hartmann (2007): the characteristics that mark boundaries and the categorizations and persons that emerge. Gilroy (2000: 47) has argued for recognizing the shift towards molecularized ‘race’, whereby ‘the boundaries of “race” have moved across the threshold of the skin. They are cellular and molecular, not dermal’. While genetic technologies have focused attention on DNA markers, this quote appears to imply that the shift to molecularized ‘race’ may have actually negated the previous physical markers of ‘race’. It is perhaps more advantageous to consider the ways that DNA can become an additional boundary-marking characteristics of ‘race’. Indeed, in a similar vein, the kinds of categorizations

that are used – and persons marked by that categorization – have seen ‘race’ and ethnicity joined (but not replaced) by ancestry, heritage and ‘admixture’. Theories of ‘admixture’ may sound novel but, as Fullwiley (2008: 726) argues, these invoke a notion of ‘racialized genomic fractions’ because ‘new genetic technologies that link geography and “ancestry” do not necessarily depart from older notions of “race”’. The usage of the notion that ‘race’ is a social construction in the Special Issue of *Nature Genetics* can be located as part of this coexistent multiplicity. Nevertheless, such a coexistence should not detract from the power or importance of the notion of ‘race’ in particular. It is worth reiterating that racialization is not simply a ‘problematic outcome’ of this branch of biomedical science but also appears to play a significant role in shaping the very contours of the subject which scientists are struggling to better comprehend.

As the boundary markers and categorizations in debates about genetics and human populations are multiple and overlapping (and potentially socially meaningful), they seem likely to remain ambiguous and subject to disagreement and blurring. This ambiguity is readily found in consumer-facing corporate science. *23andMe*, which sells DNA tests for health risks, tells customers that its information on, for example, hypertension is suitable for people of ‘European ethnicity’ (www.23andme.com). We are left in little doubt that differences between groups are important here and that we should be able to decide whether or not we belong to the group which is specified. However, we are still none the wiser about what the company means by ethnicity, where the boundaries of Europe lie and what proportion of our genome needs to be considered European before this potentially important information about health risks becomes relevant to us.

Note

1. Freely available at: <http://www.nature.com/ng/journal/v36/n11s/index.html>.

Bibliography

- Anand, S.S. 1999. ‘Using Ethnicity as a Classification Variable in Health Research: Perpetuating the Myth of Biological Determinism, Serving Socio-political Agendas, or Making Valuable Contributions to Medical Sciences?’, *Ethnicity and Health* 4(4): 241–44.
- Andreasen, R.O. 2000. ‘Race: Biological Reality or Social Construct’, *Philosophy of Science* 67(S1): 653–66.
- Aspinall, P. 1997. ‘The Conceptual Basis of Ethnic Group Terminology and Classifications’, *Social Science and Medicine* 45(5): 689–98.
- 2001. ‘Operationalising the Collection of Ethnicity Data in Studies of the Sociology of Health and Illness’, *Sociology of Health and Illness* 23(6): 829–62.
- Bhopal, R. 1997. ‘Is Research into Ethnicity and Health Racist, Unsound or Important Science?’, *British Medical Journal* 314: 1751–56.
- Bliss, C. 2008. ‘Mapping Admixture through Race’, *International Journal of Technology, Knowledge and Society* 4: 79–83.
- Bradby, H. 2003 ‘Describing Ethnicity in Health Research’, *Ethnicity and Health* 8(1): 5–13.

- British Medical Journal. 1996. 'Style Matters: Ethnicity, Race and Culture: Guidelines for Research, Audit and Publication', *British Medical Journal* 312: 1094.
- Burchard, E.G. et al. 2003. 'The Importance of Race and Ethnic Background in Biomedical Research and Clinical Practice', *New England Journal of Medicine* 348(12): 1170–75.
- Campbell, B. 2007a. 'Media Storylines of Culturally Hybrid Persons and Nation', in P. Wade (ed.), *Race, Ethnicity and Nation. Perspectives from Kinship and Genetics*. Oxford: Berghahn Books, pp. 169–86.
- 2007b. 'Racialization, Genes and the Reinvention of Nation in Europe', in P. Wade (ed.), *Race, Ethnicity and Nation. Perspectives from Kinship and Genetics*. Oxford: Berghahn Books, pp. 95–124.
- Cooper, R.S., J.S. Kaufman, and R. Ward. 2003. 'Race and Genomics', *New England Journal of Medicine* 384(12): 1166–70.
- Cornell, S. and D. Hartmann. 2007. *Ethnicity and Race: Making Identities in a Changing World*. California: Pine Forge Press.
- Duster, T. 2005. 'Medicine. Race and Reification in Science', *Science* 307(5712): 1050–51.
- Edwards, A.W.F. 2003. 'Human Genetic Diversity: Lewontin's Fallacy', *BioEssays* 25(8): 798–801.
- Ellison, G.T.H. 2006. 'Medicine in Black and White: BiDiL[®], Race and the Limits of Evidence-based Medicine', *Significance* 3(3): 118–21.
- Ellison, G.T.H and I.R. Jones. 2002. 'Social Identities and the "New Genetics": Scientific and Social Consequences', *Critical Public Health* 12: 265–82.
- Ellison, G.T.H. and M. Rosato. 2002. 'The Impact of Editorial Guidelines on the Classification of Race/Ethnicity in the British Medical Journal', *Journal of Epidemiology and Community Health* 56: 45A.
- Ellison, G.T.H. et al. 2007. 'Racial Categories in Medicine: A Failure of Evidence-based Practice?', *Public Library of Science Medicine* 4: 1434–1436.
- Epstein, S. 2007. *Inclusion: The Politics of Difference in Medical Research*. Chicago: Chicago University Press.
- Fausto-Sterling, A. 2008. 'The Bare Bones of Race', *Social Studies of Science* 38: 657–94.
- Freeman, H.P. 1998. 'The Meaning of Race in Science – Considerations for Cancer Research', *Cancer* 82: 219–25.
- Fullwiley, D. 2007. 'The Molecularization of Race: Institutionalising Human Differences in Pharmacogenetics Research', *Science as Culture* 16: 1–30.
- 2008. 'The Biological Construction of Race: "Admixture" Technology and the New Genetic Medicine', *Social Studies of Science* 38: 695–735.
- Gannett, L. 2004. 'The Biological Reification of Race', *British Journal of the Philosophy of Science* 55: 323–45.
- Gieryn, T.F. 1983. 'Boundary-Work and the Demarcation of Science from Non-science: Strains and Interests in Professional Ideologies of Scientists', *American Sociological Review* 48: 781–95.
- Gilroy, P. 2000. *Against Race: Imagining Political Culture Beyond the Color Line*. Cambridge, MA: Belknap Press.
- Hacking, I. 1999. *The Social Construction of What?* Cambridge, MA: Harvard University Press.
- 2005. 'Why Race Still Matters', *Daedalus* 134(1): 102–16.
- 2006. 'Genetics, Biosocial Groups and the Future of Identity', *Daedalus* 135(4): 81–95.
- Hartigan, J. 2006. 'Saying "Socially Constructed" is not Enough', *Anthropology News* 47(2): 8.
- 2008. 'Is Race Still Socially Constructed? The Recent Controversy over Race and Medical Genetics', *Science as Culture* 17: 163–93.

- Howell, S. and M. Melhuus. 2007. 'Race, Biology and Culture in Contemporary Norway: Identity and Belonging in Adoption, Donor Gametes and Immigration', in P. Wade (ed.), *Race, Ethnicity and Nation. Perspectives from Kinship and Genetics*. Oxford: Berghahn Books, pp. 53–72.
- Hunt, L.M. and M.S. Megyesi. 2008. 'The Ambiguous Meanings of the Racial/Ethnic Categories Routinely Used in Human Genetics Research', *Social Science and Medicine* 66: 349–61.
- International HapMap Consortium. 2003 'The International HapMap Project', *Nature* 426: 789–96.
- Jenkins, R. 1996 *Social Identity*. London: Routledge.
- Kahn, J.D. 2004. 'How a Drug Becomes "Ethnic": Law, Commerce, and the Production of Racial Categories in Medicine', *Yale Journal of Health Policy, Law and Ethics* 4(1): 1–46.
- Kaplan, J.B. and T. Bennett, 2003. 'Use of Race and Ethnicity in Biomedical Publication', *Journal of the American Medical Association* 289: 2709–16.
- Keita, S.O.Y. and R.A. Kittles. 1997. 'The Persistence of Racial Thinking and the Myth of Racial Divergence', *American Anthropologist* 99: 534–44.
- Keita, S.O.Y. et al. 2004 'Conceptualizing Human Variation', *Nature Genetics* 36: 17–20.
- Kevles, D. 1985. *In the Name of Eugenics: Genetics and the Uses of Human Heredity*. New York: Knopf.
- Lewontin, R. 1972. 'The Apportionment of Human Diversity', *Evolutionary Biology* 6: 381–98.
- Marre, D. 2007 "'I Want Her to Learn Her Language and Maintain Her Culture": Transnational Adoptive Families' Views of "Cultural Origins"', in P. Wade (ed.), *Race, Ethnicity and Nation. Perspectives from Kinship and Genetics*. Oxford: Berghahn Books, pp. 73–94.
- Martin, P. et al. 2007. 'Reviving Racial Medicine? The Use of Race/Ethnicity in Genetics and Biomedicine Research, and the Implications for Science and Healthcare', project report. London: Faculty of Health and Social Care Sciences, St George's University of London.
- Mason, D. 2000. *Race and Ethnicity in Modern Britain*. Oxford: Oxford University Press.
- Miles, R. 1982. *Racism and Migrant Labour*. London: Routledge & Kegan Paul.
- _____. 1989. *Racism*. London: Routledge.
- Mountain J.L. and N. Risch. 2004. 'Assessing Genetic Contributions to Phenotypic Differences among "Racial" and "Ethnic" Groups', *Nature Genetics* 36(1): 48–53.
- Nature Genetics Editorial. 2000. 'Census, Race and Science', *Nature Genetics* 24(2): 97–98.
- _____. 2001. 'Genes, Drugs and Race', *Nature Genetics* 29(3): 23–40.
- _____. 2004a. 'The Unexamined "Caucasian"', *Nature Genetics* 36(6): 541.
- _____. 2004b. 'The Unexamined Population', *Nature Genetics* 36(1): S3.
- Nazroo, J.Y. 1998. 'Genetic, Cultural or Socio-economic Vulnerability? Explaining Ethnic Inequalities in Health', *Sociology of Health and Illness* 20(5): 710–30.
- Nelson, A. 2008 'Bioscience: Genetic Genealogy Testing and the Pursuit of African Ancestry', *Social Studies of Science* 38(5): 759–83.
- Omi, M. and H. Winant. 1986. *Racial Formation in the United States*. New York: Routledge & Kegan Paul.
- Outram, S.M. and G.T.H. Ellison. 2006. 'Improving the Use of Race/Ethnicity in Genetic Research: A Survey of Instructions to Authors in Genetics Journals', *Science Editor* 29(3): 78–81.
- Patrinos, A. 2004. "'Race" and the Human Genome', *Nature Genetics* 36(1): S1–2.
- Phimister, E.G. 2003. 'Medicine and the Racial Divide', *New England Journal of Medicine* 348(12): 1081–82.

- Risch, N. et al. 2002. 'Categorization of Humans in Biomedical Research: Genes, Race and Disease', *Genome Biology* 3(7): 1–12.
- Rose, N. 2007. *The Politics of Life Itself: Biomedicine, Power, and Subjectivity in the Twenty-first Century*. Princeton, NJ: Princeton University Press.
- Rosenberg N. et al. 2002. 'Genetic Structure of Human Populations', *Science* 298(5602): 2981–85.
- Rotimi, C.N. 2004. 'Are Medical and Nonmedical Uses of Large-Scale Genomic Markers Conflating Genetics and "Race"?', *Nature Genetics* 36(11 Suppl): S43–7.
- Royal, C.D.M. and G.M. Dunston. 2004. 'Changing the Paradigm from "Race" to Human Genome Variation', *Nature Genetics* 36(1): S5–7.
- Sankar, P. and M.K. Cho. 2002. 'Toward a New Vocabulary of Human Genetic Variation', *Science* 298(5597): 1337–38.
- Sarich, V. and F. Miele. 2004. *Race: The Reality of Human Difference*. Boulder, CO: Westview Press.
- Satel, S. 2002. "I am a Racially Profiling Doctor", *The New York Times Magazine*, 5 May.
- Schwartz, R. S. 2001. 'Racial Profiling in Medical Research', *New England Journal of Medicine* 344(18): 1392–93.
- Smart, A. et al. 2006. 'Can Science Alone Improve the Measurement and Communication of Race and Ethnicity in Genetic Research? Exploring the Strategies Proposed by Nature Genetics', *BioSocieties* 1(3): 307–18.
- 2008a. 'Social Inclusivity vs. Analytical Acuity? A Qualitative Study of UK Researchers Regarding the Inclusion of Minority Ethnic Groups in Biobanks', *Medical Law International* 9: 169–90.
- 2008b. 'The Standardisation of Race and Ethnicity in Biomedical Science Editorial and UK Biobanks', *Social Studies of Science* 37(3): 407–23.
- Solomos, J. 2003. *Race and Racism in Britain*, 3rd edn. Basingstoke: Palgrave Macmillan.
- Wade, P. 2004. 'Human Nature and Race', *Anthropological Theory* 4(2): 157–72.
- 2007. 'Race, Ethnicity and Nation. Perspectives from Kinship and Genetics', in P. Wade (ed.) *Race, Ethnicity and Nation. Perspectives from Kinship and Genetics*. Oxford: Berghahn Books, pp. 1–31.
- Witzig, R. 1996. 'The Medicalization of Race: Scientific Legitimization of a Flawed Social Construct', *Annals of Internal Medicine* 125(8): 675–79.
- http://www.23andme.com/health/pre_hypertension, date accessed 20 February 2011.