Race and Genomics. Old Wine in New Bottles?

Documents from a Transdisciplinary Discussion

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From July 25 to 29, 2007, the biennial meeting of the *International Society for the History, Philosophy, and Social Studies of Biology* (ISHPSSB) was hosted by the University of Exeter. About 430 papers were submitted, and we had the pleasure to put together a programme as well as a plenary session of invited speakers on a topic of their choice. After some discussion within the programme committee, we decided to organize a session of four speakers who were asked to address, each from a different disciplinary perspective, the recent re-emphasis on racial categories in genomic studies of ancestry, public health, pharmacology, and forensics.¹

The topic was not only chosen because of its timeliness. It so happened that the ISHPSSB meeting also coincided with the tercentenary of both Georges Buffon and Carl Linnaeus. Both are arguably the founding fathers of modern biology, with the emphasis they put on the reproduction rather than the generation of living beings (Müller-Wille/Rheinberger 2007). But there is also another legacy of these naturalists, one which is more problematic. This is racial anthropology which both Buffon and Linnaeus, almost simultaneously, initiated by their proposals for a universal partitioning of mankind along lines of skin colour, temperament, and descent (Sloan 1995). This original classification of mankind into three or four major "races" – a white, a black, and a yellow or red one – is still very much in place, even in the high-tech contexts of today's genomics. According to its own rhetoric, for example, the International Haplotype Map Project studies human genomic variation through four sample "populations" (see <http://www.hapmap.org/abouthapmap.html>). The choice of these sample populations, however, is revealing: the Yoruba in Ibadan, Nigeria; Japanese from Tokyo; the Han Chinese from Beijing; Utah residents with ancestry from northern and western Europe. This choice was undoubtedly guided by the colour scheme originally proposed by Linnaeus and Buffon. The history of race in biology and medicine exhibits a curious mixture of archaic and innovative elements.

Until very recently there existed a broad consensus among scientists, as well as students of science, that racial anthropology belonged to a past thoroughly outdated by the combined efforts of mathematical population genetics and molecular biology, a consensus that dates back to the so-called UNESCO Statement on Race from 1951. However, in the wake of the completion of the Human Genome Project, and with projects like the Human Diversity Project, the HapMap Project, various national ‘biobank’ projects, and a diversity of private and public initiatives of ‘ancestry’ research, racial categories appear to have regained significance in recent years again, inside and outside of the biomedical sciences. Human genomic diversity is mapped against grids of racial distinctions, drugs and life-style recommendations target racially defined groups, and genetic tests offer the opportunity to determine ancestry in racial terms. Increasingly, close historical scrutiny also reveals that race was not only put back on the agenda again occasionally by high-profile publications like Richard J. Herrnstein’s and Charles Murray’s *The Bell Curve* (1994), but that it has also formed a persistent thread in medical and population genetics research throughout the post-WWII era (Pogliano 2005, Wailoo/Pemberton 2006).

To set the stage for the plenary session, we included five questions in the letter of invitation that we sent to the four speakers. It may be useful to quote them here, as they were originally formulated: “What is it about racial categories – famously introduced in an ad hoc fashion by Buffon and Linnaeus, and again and again denounced as primitive and untenable by prominent life-scientists in the course of their long history – that lets them persist, even in the high-tech world of present day genomics and systems biology? Or is this resilience just an illusion? Has ‘race’, just like any other scientific concept, acquired very different meanings in different historical settings? In that case: How does ‘race’ in its present usage differ from ‘race’ in the past? And which recent social and political developments have triggered its renewed significance?”

The four statements that were given in front of the delegates of the ISHPSSB meeting on the morning of July 26, 2007, were very different in style and perspective. We will not endeavour to distil a common take-home message from them, but will let each speak for themselves. One common structural element to all of them, however, is probably worth pointing out, as it may reflect the specific historical moment in which the session took place. This is the acknowledgement that “race” is not *per se* an “irrational” concept, but a highly variable and diverse concept that was and continues to be shaped by the ways in which science and society are articulated.

Note

- 1 A webforum that documents the state of discussion when we started to plan the session can be accessed at <http://www.racesci.org/home.html>.

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Is there a Biological Concept of Race?

Jean Gayon

Most contemporary biologists have abandoned the use of the term “race” in scientific discourse. Other words are used to categorise intra-specific taxonomic diversity: sub-species, variety, strain, local population, deme, etc. These words are ideologically more neutral than “race.” Nevertheless, biologists find it difficult when they discuss with a public that continues to use the vocabulary of “race.” For example, when a biologist says “races do not exist”, the exact meaning is generally unclear. Does he or she mean that the notion of race is confused? Or that the term does have a precise meaning, but that what it refers to does not exist, either in nature in general, or among humans in particular? This is the question I want to examine in two steps.

First I will consider what the category of race could mean for modern biologists as a whole; then I will examine those aspects that specifically relate to humans.

The modern view of race among biologists is dominated by their understanding of the category of the species. In a remarkable paper on “Species Concepts and Species Definitions,” Ernst Mayr stated that there are three theoretical concepts of the species. The first theoretical concept is the typological species concept, based on the notions of similarity and difference. The biologist using this approach considers the species as a group of individuals who share certain essential properties. The second theoretical concept is the “nondimensional” concept: “The essence of this concept is the relationship between two coexisting populations in a nondimensional system, that is, at a single locality at the same time (sympatric and synchronous)” (Mayr 1957: 14). Two individuals, or groups of individuals, are described as belonging to two different species if, for instance, they are unable to produce fertile offspring (reproductive isolation). This species concept is relational in the same way as, for example, “being the brother of” is a relation and not a property inherent to someone. The non-dimensional concept is centred on a distinctness, and not a difference. The third theoretical species concept Mayr identifies is the “multidimensional” concept, which defines the species as a group of interfertile populations distributed in space and time. This “collective” species concept is by definition “dimensional” because it specifies the spatio-temporal extension of the species. Unlike the non-dimensional concept, it does not always lead to clear distinctions.

Mayr’s three theoretical species concepts can help us to clarify the meaning of the concept of biological race. Just as there is a typological species concept, there is a typological concept of race. A race is then a class of individuals who possess a set of essential properties that other individuals do not possess. There is no “nondimensional” concept of race, because there is no reproductive discontinuity between two sympatric and synchronous races. The most operational theoretical species concept thus has no equivalent concept of race. There is, on the other hand, a “multidimensional” concept of race, similar to the multidimensional concept of species. What biologists and anthropologists call or have called “races” can be described as populations or groups of populations, situated in space and time and forming a real or potential reproductive community. When the philosopher Robin Andreasen claims that contemporary biologists should admit that human races exist or have existed in the past as “clades,” she means no more than this (Andreasen 1998).

Thus, if we wish to have a biological concept of race, it will be an entity that oscillates between a type and an evolving reproductive community. The biologist may try to link the two aspects or dissociate them. The former approach would be that of racial anthropology in the nineteenth and early

twentieth centuries, which tried to marry the aspects of a classificatory and an evolutionary category. On the other hand, the biologists who developed the evolutionary synthesis in the 1930s dissociated these two aspects of the concept of race. Theodosius Dobzhansky, for instance, repeatedly argued that races as classificatory groups were mere conventions, whereas the process of “raciation”, that is of the differentiation of local populations that are partially reproductively isolated, is an objective process (Dobzhansky 1937: 39–72). A more radical approach – which today is widely adopted and which can be traced back to the 1930s – would be to stop talking of races for evolving populations, and to banish it from both biology and anthropology (Montagu 1942, on this attitude, see Gayon 2003).

Debates on the biological relevance of the concept of race generally take place with regard to sexually-reproducing organisms, where the reproductive criterion is so important. I would like to provide a counterpoint to the previous discussion by examining a group of organisms for which the concept of race might be clearer than that of species: bacteria.

Bacteria generally reproduce asexually, by simple division. However, some bacterial processes allow an exchange of genetic material. This exchange is quite different from that shown by eukaryotic organisms (I rely here on Co-han 1996).

1. In most groups of bacteria, genetic recombination is rare. For example, in *Escherichia coli* its frequency is 10^{-8} per genic segment and per generation.
2. Bacteria rarely exchange their genes, but they can do so with species that are relatively distant in terms of their DNA sequence. Homologous recombination can be seen in species that may diverge for up to 25% of the sequence of their homologous genes. This figure is amazingly high. As a comparison, even in the most primitive animals the level of divergence is not greater than 2%. Furthermore, genes are also exchanged in plasmids, with even more divergent forms.
3. The quantity of genetic material thus exchanged is small compared with the amount exchanged by eukaryotes during a cycle of sexual reproduction. Whereas a eukaryote receives almost equal amounts of DNA from each of its parents, a bacterium receives only a small fraction of the genome of another individual (a few kilobases, less than 0.1 % of the bacterial genome).

These aspects of bacterial genetic exchange produce evolutionary scenarios that are very different from those found in the eukaryotic world. In sexually-reproducing animals and plants, natural selection has only a limited effect on genetic diversity. The extremely high level of recombination (which is strictly speaking maximal because, at each generation, two entire genomes

are associated in the same organism) means that an advantageous mutation is diffused in a population without bringing with it the whole genome of the mutant individual. In bacteria, given that recombination is rare, the selection of an advantageous mutation carries with it the whole genome of the mutant individual. Any natural selection event therefore leads to a “purge of diversity” in the local clones. Therefore genetic exchange does not preserve genetic diversity among bacterial populations.

In such a situation, the traditional category of race is much more plausible than in fully sexually reproducing organisms. A local population, ecologically adapted, can be characterised both as a robust type (that is, as a class of homogeneous individuals) and as an evolutionary line with a limited life-span. Similarly, the notion of species as a closed reproductive community is problematic for bacteria. In reality, bacterial taxa are biological species, that is, cohesive and isolated reproductive communities for a fraction of their genome only.

Bacteria therefore present us with a set of organisms in which the notion of race is easier to deal with than the notion of species. Locally adapted populations of bacteria are good candidates to be considered as races, because they possess the very properties that make this status so problematic in the case of sexually-reproducing plants and animals. They are entities that can be described both as types (transitory types, but types nevertheless), as temporary but coherent reproductive communities and, furthermore, as reproductive communities that are not isolated from other similar groups.

This example shows that the category of race is not in and of itself undermined by conceptual problems that make it impossible to apply it to any real biological situation. It shows that the pertinence of the category of biological race is not only a conceptual question. It also has empirical aspects, which I am now going to explore by turning to the particular case of humans.

In the case of humans, two different questions should be distinguished. (1) What is the biological relevance of the concept of human race? (2) What is its social meaning? On the first problem, I will be brief. First, most contemporary biologists have given up the use of the word race, because it has been so confusing and so dangerous in the past (Provine 1973). But they have not renounced to make use of one or the other aspect of the concept of race, the classificatory aspect and the evolutionary aspect (race as an evolving reproductive community). It depends on the context. Medical genetics, for pragmatic reasons, often uses a limited notion of human races as types. Human population geneticists have accumulated a tremendous amount of data on the evolution of the partially isolated reproductive communities of “Modern Man” that have peopled the earth for one or two hundred thousand years. Most of these human geneticists avoid using the word “race” (Cavalli-

Sforza et al. 1994). In contrast, medical geneticists are not as much opposed to the use of this word. This situation confirms that “race” is decidedly more a typological than an evolutionary concept. Of course, medical geneticists do not mean that the racial groups they construct are stable and somehow immunized against evolution. They merely claim that, in a pragmatic way, these racial groups have statistical relevance in given epidemiological situations (see Ellison et al. in this issue).

To conclude, I would like to relativize the biological approaches to the notion of race in the case of humans, and say that in humans, the most important aspect of race is not the biological aspect, but rather race as a social signifier. In a remarkable book published around 30 years ago, the sociologist Colette Guillaumin argued that we should distinguish two levels of discussion in the question of human races: the “concrete” level which, she argues, is that of biological research, and the “symbolic” level, which relates to the function of the signifier “race” in modern societies. Guillaumin insisted that the question of race as a social signifier is separate from that of the result of scientific debates on races as natural objects. Race as a social operator is not so much a concept as a fetish-notion. What is important is not whether it exists or not, but what it produces in practice. “*That* [i.e., race] does not exist. That leads to death. It is a murder machine, a technical murder machine. Of proven efficacy. It is a way of rationalising and organising the murderous violence and the domination of some social groups over other social groups that have been rendered powerless.” (Guillaumin 1972: 65)

For Guillaumin, symbolic race, although it might not have any objective biological meaning, nevertheless maintains a close relation with biological signifiers. Races are social categories covered in a biological veneer. It does not really matter whether this veneer is real, fictitious or artificial (as for example with circumcision amongst Jews). The important point is that the social space which is the race is marked by a physical trait, an inscription on the body. The function of this “biologisation” is to radicalise differences by presenting them as “physical” and “irreversible”. We should never forget this social dimension of race. Historically, this notion was primarily built in reference to humans, with a clear objective of forming a hierarchy (see Mazzolini in this issue). I don’t think that we should be too dogmatic about saying that there is no biological concept of race. As I have tried to show, this is a rather complex affair. But I do think that the word has been so harmful in the past that we had better not use it without being fully aware of its primarily human connotations.

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Race in History

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The only way I may contribute to the issue under discussion is by briefly talking about my own research and then by addressing four of the five questions that have been put on the floor by the organizers of this session (see introduction). Let me also state straight away that I feel more confident with literature published between 1600 and 1850 than in contemporary scientific literature on race and that my knowledge is limited to ideas and theories put forth in western Europe and North America.

It is generally assumed that the term race took on a taxonomic meaning at the very end of the eighteenth century. Many of the authors I studied worked before that date, before the notion of race was solidified, and they investigated skin colour (Mazzolini 1994). It should be noted that in the period running from the early seventeenth century to 1800 human pigmentation

- was the object of intense anatomical, microscopical, physiological and chemical investigations giving rise to a number of theories which attempted to explain how human differences in skin colour came about;
- was used as the principal marker for classifying human varieties from a zoological point of view;
- was viewed as the main trait indicating interracial crossing and thus provided an element of analysis for what is often called pre-Mendelian genetics;
- stimulated scholars to think about the original colour of mankind by appearing in pathological conditions such as albinism;
- was the corner stone on which the notion of race was constructed;
- was used to construct powerful models of somatic identities (e.g. white, black, yellow, brown and red) which still have far more devastating effects on human relations than the very notion of race.

Theories of skin colour cannot be understood without considering slavery and colonialism. At the end of the eighteenth century and in the early nineteenth century skin colour was linked to history, civilisation and social structure. And so was the notion of race, for which skin colour remained the main marker of racial differences (Mazzolini 2007). For this reason I stress that race is a biopolitical notion, that is, a notion that has been used in daily life as well as by the life sciences and the social sciences, with the result of reciprocal contaminations. At a historical level this is quite evident. Some scholars distinguish four distinct ideas of race: status-race, formal-race, historical-race, and culture-race. From my point of view, it is interesting to note that in all these four ideas of race, colour plays a significant role.

The first question put to us by the organisers of this session was: "What is it about race categories that lets them persist, even in the high-tech world of present day genomics and systems biology?" My answer is: First, their persistence is more limited than it used to be and second, when they do persist this happens because some race categories are primitive and morphology, or a person's visual appearance, is not eradicated in daily life by statements made by academics. I attribute most of this persistence to the political side of the notion of race which is still embedded in many Western national cultures.

The second question put forward was: "Is the resilience of race categories just an illusion?" No, I do not think it is an illusion. An Italian colleague of mine, Claudio Pogliano, compared the historical fortune of the notion of race to the sun's transit and said that now the sun of race looks as if it were sinking but actually stands still on the horizon in an "unaccomplished sunset" (Pogliano 2005).

The third question was: "Has 'race' just like any other scientific concept, acquired very different meanings in different historical settings?" In the pref-

ace to *The Races of Man* of 1850, Robert Knox wrote that “Race is everything: literature, science, art, in a word, civilisation, depend on it.” I do not think that anyone will subscribe to this statement today. On the other hand, when I started my own research in the late 1980s, I was convinced that the scientific notion of race, just like the notions of phlogiston, caloric and ether, had been consigned to the dustbin of history. To my amazement I now see that a limited number of scientists try to pick it up again (see Ellison et al. in this issue). As a historian I am therefore forced to take note that aspects of the notion of race survive (although they appear to me either dated or unnecessary), while as a citizen – in my own Italian environment – I am entitled to act in such a way as to make sure that such notions will not be as noxious as they have been in the past.

The fourth question was: “How does ‘race’ in its present usages differ from ‘race’ in the past?” Let me point out a difference but also a similarity with past views. With respect to the difference: at the time that I know most about – the eighteenth century – genetics, which today is central to the discourse about race, did, of course, not exist. However – and now I come to my point of similarity – by the early part of the twentieth century genes or genetics had very much entered notions of race and in fact produced eugenics and, in the political sphere, worse things. It is this similarity that should give us cause for concern about today’s resurgence of what we attribute to genes and how we deal with any remnants of race notions or other genetically defined categories of humankind.

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Race and Biology. Beyond the Perpetual Return of Crisis

Jenny Reardon

The use of racial categories in biology has once again arisen as a problem in political and scholarly arenas. As the editors of this issue note, “until recently there existed a broad consensus among scientists, as well as students of science, that racial anthropology belonged to a past thoroughly outdated by the combined efforts of mathematical population genetics and molecular biology.” Several other similar moments of consensus preceded this one. In each moment, natural scientists, social scientists and the popular press concurred that a new powerful science had emerged that could reveal the truth, and thus counter social ideologies, about “race”: the science of population genetics in the 1950s, molecular biology in the 1970s, the genome sciences and bioinformatics in the 1990s and today. In each case, a crisis re-occurred as social ideologies of race once again became associated with biological ideas and practices. In the brief space at my disposal here I would like to reflect on what produces this experience of the cyclical return of the problem of race in biology. I would like to then offer a diagnosis of what is unique about the current moment of return, and how we might respond to it.

I begin by asking what accounts for the experience of this constant return of the race problem in biology. I suggest that it is all but guaranteed by the conceptual distinctions that have been used to address it. Following the Nazi atrocities, nearly every effort to address “the race question” in biology has presumed that scientists can and should refine their use of race so as to advance scientific knowledge and exclude “social” discrimination (Reardon 2005, UNESCO 1952). Such endeavours have taken for granted that science can and should be strictly delineated from society. Thus, no matter the particularities of any given claim about race (“race is biologically meaningful when it is used to study human evolution” or “race is not biologically meaningful when the goal is to understand mental traits” etc.), each claim depends on the following assumptions: the science of race can and should be distinguished from racist ideologies; natural order exists in a separate domain from social order; scientific racism results from the latter (ideology, social order) posing as the former (science, natural order). I suggest that it is this bifurcated conceptual framework – one that delineates science from society, natural order from social order – and not any particular answer to “the race question” itself, that produces the experience of a perpetual return of a race problem in biology: the IQ debates in the 1960s and 1970s; the controversies sparked by the 1994 publication of the *The Bell Curve*; Armand Leroi’s 2005 announcement in the *New York Times* that race is real; the explosion in the

last few years of claims that link genetic variants to particular races (Herrnstein 1994, Leroi 2005).

Of course, all architects of post WWII efforts to erect a protective wall between biology and society intended to preclude just these sorts of returns (cf. Gayon in this issue). Political leaders and scientists alike built institutions and knowledge practices upon conceptual structures that separated biology from society to ensure that social biases did not creep into the potent zone of science, and create the conditions for the next biologized legitimization of discrimination (Reardon 2005). Why did these efforts fail?

They failed, I and Brody Dunklee and Kara Wentworth argue elsewhere, because if one conceives of biology as a distinct realm of knowledge production that exists apart from any societal taint, then no one attends to the construction of biological concepts and practices of race. Social scientists and humanists do not feel obliged, for, after all, biology is supposed to fall outside their critical purview. Biologists do not attend to the construction of their concepts of race, for they hold their categories to arise from nature, not from the social and political realms of human construction. The result is that biological laboratories become sites where new techniques for distinguishing between human beings form without any attendant sociological or humanistic analysis.

This bifurcated system remains viable as long as what it conceals remains palatable. However, once the biological concepts of race, and the political and social ideas to which they are conjoined, become extreme – meaning shared by few, and generally viewed as racist – then these concepts of race become impossible to ignore. At this point, efforts to purify and spin biology and society out into their respective poles collapse. Over the years, sociologists and humanists have experienced this collapse as the periodic return of the idea of race in science. Biologists have experienced them as the periodic politicization of their science. As Dunklee, Wentworth and I explain: “For both sides, a crisis emerges. For the sociologists and humanists, it is that biological race has risen again. For the biologists, it is that something extreme enough to be recognized as political has emerged within their purportedly apolitical discipline. Both are the direct consequence of a system that delineates the social and the political from the biological: sociologists and humanists can only encounter race’s return within biology when they fail to see it all along; biologists can only experience a shock of politicization when the ongoing political dimensions of their work are out of view” (Dunklee/Reardon/Wentworth 2006).

We would appear to be in another such crisis moment of return and politicization. But is this return like all the previous ones? I want to suggest that it is not. Let me offer a few brief observations about this current moment, and how we might intervene now so as to perhaps interrupt the seeming compulsive return of the race problem in biology.

To understand this current historical conjuncture, I must add one more dimension to my explanation of why we experience a seeming compulsive return to the problem of race in biology: a spatial-temporal dimension. In the past we experienced in different temporal moments the entanglement of biology and society and the purification of biology from society, the politicization of biology and its de-politicization, the assertion that there are no valid concepts of biological race and the proliferation of biological concepts of race. During the Holocaust, for example, the experience for many was one of biology and society collapsing into an explosive core, creating biological justifications for mass extermination of human life. In a different moment, after World War II, biologists along with architects of post WWII liberal institutions attempted to respond to this “race problem” by attempting to spin biology and society back out into their separate poles. They, for example, produced public documents that proclaimed science to exist in a separate domain from society – most notably, the UNESCO Statements on Race published in 1950 and 1951 (UNESCO 1952). Similarly, during the first part of the twentieth century, nation-states – such as the United States, England and Germany – defined race in oppressive ways, enabling eugenic policies (Paul 1995). This, for many, represented the politicization of biological studies of human differences. An era of de-politicization followed when in the second half of the twentieth century states, through practices of self-identification, purportedly granted the power to define race to individuals, thus eliminating the states’ need to draw upon the biological sciences to define race. In each case, a temporal distinction existed between the experience of the entanglement of biology and society and the experience of the purification of biology from society, the experience of the politicization of (or state involvement in) science, and the experience of its de-politicization. This temporal separation helped to make it possible to diagnose the race problem as a problem created by spheres (the social and the scientific) encroaching on one another, for a different temporal moment offered a space for separation: the separation of biology from society, truth from politics, and ideology from power. The belief in separation that resulted created the conditions for the return of the race problem in biology.

What differentiates the current crisis from past ones is that the space of separation has all but collapsed. Increasingly, purification and entanglement, politicization and de-politicization, control by the state and individual empowerment, the negation of biological concepts of race and their proliferation happen concurrently. At the same time that genetic ancestry tests act to delink race from the state through “individualizing” the experience of racial identification, data from these tests are used to build DNA databases that support an increasing number of state-organized biopolitical projects.¹ At the same time that state sponsors of genomic databases, such as the International Haplotype Map Project (HapMap), instruct users of these databases

to eschew racial categories in favour of more “precise language,” users of the databases in practice use categories such as “European,” “African” and “Asian” in a proliferating number of contexts.² Politicization and de-politicization, definition of race by the state and definition of race by individuals, claims to eschew racial categorization and the proliferation of the use of racial categories occur in the same moment.

This synchronicity creates dissonance. Claims by researchers that they are not studying race, while at the same time trading in the categories of “African,” “Asian,” and “European” (despite the HapMap organizers’ efforts to discipline them into different categorical practices), increasingly cause dis-ease. Claims that genomics can be a part of individual empowerment, and even “recreation,” ring hollow in a time when those same “recreational” activities give rise to databases that are used to arbitrate the kind and amount of resources an individual will receive.³ A “pure” “non-political” spirit of discovery and adventure cannot account for projects like National Geographic’s Genographic Project, whose activities link to deep financial and political interests.⁴

These dissonances create fissures in narratives of purification and separation that in the past have been used to manage the race problem in biology. These fissures provide us with openings, with possibilities for interruption and reflexive awareness. Indeed, in the current moment it would take concerted effort to not see the production of new social orders of race in the production of novel biological orders. In such a moment, we have the chance to learn much, and it is politically imperative that we learn as much as we can. As scholars of biology, we now are positioned to play an important role in creating the reflexive society that Ulrich Beck predicted some 15 years ago (Beck 1992). I stop short of predicting this reflexive moment, and only urge us towards it. After all, I am too rooted in historical knowledge to believe that change happens easily. History tells us that returns are frequent, and cycles sometimes unending. But in the case of race and biology, too often these cycles have taken us through catastrophes for us to not work for something different this time.

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Notes

- 1 Such as DNA racial profiling to find individuals wanted by the state; race-based medicine; etc., see Harmon 2006, Simons 2003, Herper 2004, Kahn 2007.
- 2 For “precise” instructions to refer to populations studied in the International Haplotype Map, see <http://www.hapmap.org/citinghapmap.html.en>. For how these populations are in practice being referred to, see Keinan et. al. 2007, Hoggart et. al. 2008.
- 3 In particular, in the domains of health and education; see Bolnick et. al. 2007.
- 4 In National Geographic’s current literature, they describe the Genographic Project as a “non-medical, *non-political*, non-profit and non-commercial” [emphasis added] initiative. See, for example, https://www3.nationalgeographic.com/genographic/silk_route_announcement.html (accessed November 28, 2007). For an analysis of Genographic, see Reardon, forthcoming.

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An Interdisciplinary Perspective on the Impact of Genomics on the Meaning of “Race”, and the Future Role of Racial Categories in Biomedical Research

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As an interdisciplinary team exploring the use of racial categories in biomedical research from the perspective of epidemiology (GTHE), anthropology (GTHE, SMO), sociology (RT, AS), bioethics (RA) and science and technology studies (RT, PM, AS), what we hope to offer to this trans-disciplinary dialogue on “race and genomics” in the *NTM. Journal of the History of Science, Technology and Medicine* draws on: our analysis of the longstanding debate within the biomedical literature concerning the meaning and aetiological utility of “race” as well as interviews with 22 geneticists working on the editorial boards of high-impact genetics and biomedical journals and 36 researchers working on UK-based biobanking and pharmacogenetic projects – interviews which examined variation in the conceptualisation and operationalisation of racial categories, and the perceived utility of these categories in the analytical design of research, the interpretation of research findings, and the translation thereof across different research and clinical contexts (see Outram/Ellison 2006a, Martin et al. 2007).

At the outset, however, we feel it is important to acknowledge that much of what we hope to contribute here has already been said, and said more eloquently, by a good many commentators and analysts before us. Not least amongst these is the Loyola University epidemiologist Richard S. Cooper, whose 2003 article in the *International Journal of Epidemiology* (bearing the uncannily similar title “Race, genes, and health – new wine in old bottles”) addressed many of the questions posed by the organisers of this trans-disciplinary dialogue. Cooper felt that advances in genetic tech-

nology should have been able to resolve the contentious and questionable use of racial categories as “surrogates for genetic effects at the population level” (i.e. as markers for potentially important differences in genetic variation amongst human populations) during the important period – what anthropologist Mike Fortun (2007) has called the “meantime” – between the conceptualisation and invention of genomic technologies and their widespread use in biomedical research. Richard Cooper also recognised that there was a “tension between reaffirmation of tradition and transformation of biological concepts” in which the new genomic technologies have, somewhat paradoxically, been used *both* to confirm that there are measurable differences in genetic variation between traditional “racial” groups *and* to demonstrate that these differences are far smaller than those found between individuals *within* such groups (cf. Reardon in this issue). And although Cooper has long questioned the value of using “racial” categories as markers for genetic variation in biomedical research (see also: Cooper 1993, Cooper/Kaufman 1998) – even for the modest “racial” differences in genetic variation that have been confirmed by advances in genomic technology – he accepts that the meaning of these differences in genetic variation remain open to interpretation, and that the claim that “race has little or no biological [i.e. genetic] meaning” has been an unhelpful “irritant to geneticists who see the importance of population variation [in genetics] in an array of conditions.”

Certainly, many of the geneticists and biomedical researchers we interviewed expressed palpable irritation at what they felt to be the “politically correct” view that, as Cooper (2003) put it, “race has little or no biological meaning” (see: Outram/Ellison 2006b, Smart et al. 2008). And even though they were, for the most part, well aware of the limited reliability and validity of racial categories as markers of differences in genetic variation, they nonetheless saw the evidence of such differences between “racial” groups – however modest and context-specific these differences might be – as compelling grounds for using racial categories in their research as markers of genetic difference (Outram/Ellison 2006a, 2006b, Tutton et al. 2008). Likewise, while most of these interviewees acknowledged that the differences in disease phenotypes observed amongst different “racial” groups were the product of gene-environment interactions rather than of genes *per se*; and that cultural and socioeconomic differences between “racial” groups meant these groups were often exposed to very different “environments,” the interviewees remained pre-occupied with the potential impact of “racial” differences in genetic variation on the differential distribution of disease phenotypes by “race” and with how they might best use racial categories to explore these genetic differences in their research.

Thus, to a large extent, we have found little evidence that advances in genomic technology have led to a comprehensive re-appraisal of the mean-

ing of “race” within biomedical research, nor that it has undermined the perceived utility of racial categories as markers for differences in genetic variation (however ill-defined, context-specific and modest these differences might be). It therefore appears that the potential for genomic technologies to resolve the contentious and questionable use of “racial” categories as markers of genetic variation in biomedical research has yet to be realised – a suitable point of departure from which to address each of the five questions posed by the organisers of this trans-disciplinary dialogue.

What is it about “racial” categories that lets them persist, even in the high-tech world of present day genomics and systems biology?

Given what we have found in our analyses of the biomedical literature and interviews with geneticists and biomedical researchers, there are perhaps three potential answers to this question. First, amongst many geneticists and biomedical scientists there seems to be a deep-seated and somewhat unacknowledged or unreflective attachment to racial categories as important markers of biological (both phenotypic and genotypic) differences. This is the case despite the fact that many of these scientists know that racial categories only offer unreliable and imprecise markers for even those, very modest, differences in genetic variation which occur amongst human populations. Likewise, this view persists even though these scientists are acutely aware that the notion of “race” remains politically sensitive while the use of racial categories in scientific research has the potential to imply that the scientists involved are, in some way, “racist”.

Second, there appear to be a growing number of scientists, and lay people alike, who have been convinced by biomedical reports of phenotypic differences between “racial” groups and by geneticists who claim to be able to identify “racial” ancestry using genetic information. These reports and claims are persuasive evidence that racial categories refer to intrinsically biological (and probably genetically-determined) entities and that it is not only relevant but also important to use these categories in scientific research as if they did so. Finally, and beyond the realm of the “pure” biological sciences (and their preoccupation with “race” as an analytical category equivalent to “sub-species”) it seems clear that racial categories continue to have substantial salience as socio-political identities in societies beset with racial inequality, whether as a result of the social heritability of historical events (such as slavery, colonisation, and apartheid) or as a consequence of contemporary stigmatisation, stereotyping and discrimination (and the biological consequences of these as a result of the “embodiment” of disadvantage; Krieger 2005).

Is this resilience just an illusion?

As such it appears that the resilience of “race” as a biologically meaningful entity is far from illusory, whether as an imprecise proxy for modest intrinsic differences in genetic variation, or as a marker for the extrinsic cultural and structural factors which generate and reinforce the embodiment of phenotypic differences amongst “racial groups.” Indeed, if anything, the use of the new genomic technologies to conduct “ancestry testing” using traditional racial categories appears to have strengthened the resilience of “race” because it successfully exaggerates not only the extent of genetic differences between “racial” groups but also their potential utility (albeit only for generating estimates of racial ancestry based on genetic information). In many respects this goes beyond the circular arguments that have reproduced the notion of “race” as a biological reality since the first international attempts to discredit this (UNESCO 1950, 1951). These arguments interpreted the biological (phenotypic and genotypic) differences between “racial” groups (which are created primarily by the way these groups are categorised and treated by extrinsic social forces) as evidence that there were intrinsic (genetic) differences between these groups that were responsible for the biological (phenotypic and genotypic) differences observed and thereby warranted differential treatment along these grounds (which, in turn, leads to further biological differences... and so on...).

These arguments have now been augmented by what appears to be an undeniable fact – that there are identifiable (albeit imprecise, context-specific and modest) differences in genetic variation between “racial” groups – which no longer appears to require any conflation of extrinsic with intrinsic causes or of phenotypic with genotypic differences to sustain the belief that human “races” are naturally occurring, genetically distinct subspecies. Instead, this new ideology is sustained simply by ignoring the fact that racial categories are socially constructed, and that the differences in genetic variation observed amongst “racial” groups are a consequence of the way these are classified, and would be very different if we classified such groups differently. Unfortunately, this may prove to be an even harder critique to explain to lay people and scientists than the error of conflating extrinsic with intrinsic causes and phenotypic with genotypic differences.

Has “race” acquired very different meanings in different historical settings?

Although many biologists might disagree, it seems likely that the “species” is the only “naturally-occurring” biological category, and that all other taxonomic categories (including “subspecies” or “races”) have always been socially

constructed and somewhat arbitrary categories of convenience, regardless of the organisms they are used to classify (be these trees, snails or peoples; see Gayon in this issue on bacteria, however). In this respect, we would argue that “race,” as applied to humans, has always had the same proximate meaning regardless of the historical or cultural setting – i.e. it has always been a socially constructed and context-specific classificatory system based on phenotypic, geographical and/or cultural characteristics which creates group identities that are salient both to those doing the classifying and those being classified (if only as a result of being classified in this way). Nonetheless, in the way “races” are classified and subsequently treated, they ultimately display measurable (and occasionally pronounced) biological differences which can be taken as evidence of the profound genetic differences claimed by many “racial” scientists. These differences comprise not only the substantial phenotypic differences created by the differential treatment of “racial” groups, but also the modest genotypic differences created by the way in which geographical and socio-cultural differences in genetic variation are arbitrarily allocated to different “racial” groups when these are socially constructed.

Thus, “race” has always had a number of different meanings which are related to one another as a result of the social and biological characteristics used in classification and the social and biological consequences of this classification. As such, some of these meanings are derived from fallacious scientific theories about “natural” and genetically-distinct human subspecies, while others reflect the consequences of scientists and lay people acting as if these theories were real. This duality of meaning has always existed, simply as a result of the way in which one meaning reinforces the other and the ease with which the nature of the link between them (the social constructedness of all scientific facts) can be overlooked or ignored. Indeed, this analysis explains why repeated attempts to discredit the notion of “race” as an invalid scientific construct have failed to persuade generations of scientists faced with compelling evidence of differences in phenotypic variation amongst groups classified as “races” and with the plausible explanation offered by “racial” science that most (rather than few) of these differences were predominantly (rather than partially) the result of intrinsic genetic differences between “racial” groups (rather than differences in environmental exposure).

However, what has changed perhaps, with the advent of advances in genomic technology, is that the nature of the link between theories of difference and the realisation/production of difference – what we have called the “social constructedness of scientific facts” – seems to have been permanently lost by the evidence of irrefutable differences in genetic variation amongst “racial” groups (albeit modest differences if compared with the frequency of alleles present in all “racial” groups). This is the evidence that the geneticists and biomedical researchers we interviewed use to justify their argument that genetically-distinct “races” do exist and that it is important to take account

of these differences by using racial categories in their research designs. Future research on genetic diversity – not least on variation in ‘non-coding’ DNA and DNA repeats, a modest proportion of which also seems to differ by “race” – seems unlikely to unsettle this view. Meanwhile, there has been no equivalent technological breakthrough in the characterisation or measurement of what biologists routinely call “the” environment (and what social scientists recognise as a complex interplay of innumerable environmental characteristics) with which to challenge the resurgence of biological determinism and the geneticisation of “racial” differences. Instead, the limited role that genetic variation is thought to play in the differences in phenotypic variation observed amongst human populations – at least by critics of biological determinism – is only likely to be recognised once we fully understand and can measure environmental exposures.

How does “race” in its present usages differ from “race” in the past?

Our research with geneticists and biomedical researchers therefore suggests that the key difference between present and past usages of “race” lies in the greater certainty (i.e. the stronger evidence) these scientists now have that differences in genetic variation between “racial” groups exist. This is somewhat unexpected, because the evidence generated by recent advances in genomic technology confirms that these differences are very modest, not least in comparison to the differences found between individuals within “racial” groups. However, it is also surprising because our reviews of the literature suggested that social scientists, including a number of vocal epidemiologists, had recently made considerable progress towards reclaiming “race” from the biological sciences and recasting this as an analytical concept which reflects the lived experiences of groups classified as “races” and the phenotypic “embodiment” of historical and contemporary discrimination on the grounds of “race” (Krieger 2005).

Instead, far from embracing “race” as a socially-constructed marker of identity associated with cultural difference, socioeconomic (dis-)advantage and the phenotypic consequences thereof, it seems that an increasing number of biomedical researchers may be reverting to a more traditional “scientific” definition of “racial” groups. These are being seen as “genetically-distinct subspecies” – even though this is an inaccurate representation of the extent, nature and origins of social and biological differences between “racial” groups – and are seeking to distinguish between “race” as a “scientific” entity and the related concept of “ethnicity” as a “social” entity. This is evident in the conscious decision made by many of the geneticists and biomedical researchers we interviewed, who have responded to the socio-

political sensitivity of “race” by using ethnic classifications and labels, even though they felt that “race” better described the analytical concept they actually sought to employ.

In this way, it seems that the present usage of “race” appears to be reverting back to the more traditional (and hitherto discredited) notion of “genetically-distinct subspecies” in at least some contemporary research in both the natural and social sciences. Indeed, this can also be found elsewhere in society and social policy. As such it appears that attempts to recast “race” as a discredited and fallacious scientific concept – albeit one that nonetheless had substantive, resilient, pernicious and, to some extent, “heritable” social and biological consequences – has been somewhat less successful. Instead, the immediate consequence of advances in genomic technology appears to have been a clearer, but nonetheless illusory, distinction between the scientific concept of “race” (meaning genetically distinct subspecies) and the social concept “ethnicity” (meaning socio-culturally distinct identities).

Which recent social and political developments have triggered its renewed significance?

The geneticists and biomedical researchers we interviewed mentioned a number of social and political developments which had influenced the way they operationalised “racial” categories in their work. As mentioned earlier, the growing socio-political sensitivity of “race” had led many to adopt “ethnic” labels and categories to avoid any suggestion that they or their work was “racist” – either as a result of any prior belief in intrinsic “racial” differences (something many, nonetheless, believed to be an important influence in their work) or any desire to prove that some “racial” groups were “healthier” than others (although many, nonetheless, used “racial” disparities in health to justify their racialised analytical designs). And while many of the interviewees implied that this shift in the classification and labelling of research participants had been prompted more by “political correctness” than by a change in their theoretical understanding, some also drew on relatively recent legislative changes. For example, the US National Institutes of Health Revitalization Act (1993) and the UK Race Relations (Amendment) Act (2000) – which encourage or require scientists to ensure that their study samples reflect the diversity of the wider population and can therefore identify any differences between different subpopulations (including “racial” and “ethnic” groups). Despite their misgivings – not least about the use of “ethnicity” when they actually meant “race” – the geneticists and biomedical scientists perceived a number of analytical benefits resulting from a shift in terminology (from “race” to “ethnicity”) and the adoption of socio-political classifications (such as those developed by the US Office of Management and Budget and by the

UK Office of National Statistics). These included: the possibility that socio-political “ethnic” categories might be easier to operationalize and translate across different scientific and social contexts, and might even offer more reliable and accurate measures of differences in genetic diversity associated with geographical and socio-cultural ancestry.

Conclusion

Our analyses suggest that the resurgence of “race” in genetics and biomedical research as a result of recent advances in genomic technology – which have confirmed that modest differences in genetic variation between “racial” groups exist – does seem to be an example of “old wine in new bottles.” Past critiques of human “races” as “genetically-distinct subspecies” have traditionally adopted two distinct approaches. The first has pointed out that differences in genetic variation amongst “racial” groups (however these have been classified) simply reflect differences in the frequency of alleles across a modest number of polymorphic genetic loci, and that these differences are much smaller than those found between individuals within each “racial” group. The second has focused on the view that “racial” categories are not natural entities but are fluid, context-specific, social constructions which better reflect the importance of phenotypic, geographical and cultural factors to the classification of group identities, and the consequences of this classification on the subsequent biology of group members. While it appeared that the second of these arguments was gaining ground – not least because the more social concept “ethnicity” has evolved as a more popular way of characterising human populations than the more biological concept “race” – the inherent complexity of the first argument, which makes it conceptually challenging to non-biologists, together with the fact that it acknowledges that there are some differences in genetic variation between “racial” groups, left the door open for the way in which “racial” groups are being redefined as “genetically-distinct subspecies” following recent advances in genomic technology. And while this technology will permit the development of alternative classifications of human populations that display greater differences in genetic diversity than traditional or contemporary “racial” groups in ways that would make these more valid for genetics and biomedical research, it seems unlikely that these will do away with the pernicious notion of “races” as genetically-distinct subspecies. This is because these new classifications are likely to be linked to previous “racial” classifications, generating estimates of co-membership in each set of “groups” that will facilitate the interpretation of data from previous studies and surveys in which only traditional “racial” categories were used. It is also because these new classifications have the potential to become socially salient, and thereby susceptible to social

discrimination, as ostensibly “new races.” Thus it seems likely that advances in genomic technology have, and will continue to, strengthen the perceived validity of “race” and the perceived utility of using “racial” categories, both old and new, in genetics and biomedical research.

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