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The Biological Reification of Race

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ABSTRACT

A consensus view appears to prevail among academics from diverse disciplines that biological races do not exist, at least in humans, and that race-concepts and race-objects are socially constructed. The consensus view has been challenged recently by Robin O. Andreasen's cladistic account of biological race. This paper argues that from a scientific viewpoint there are methodological, empirical, and conceptual problems with Andreasen's position, and that from a philosophical perspective Andreasen's adherence to rigid dichotomies between science and society, facts and values, nature and culture, and the biological and the social needs to be relinquished. DNA forensics is just one field of research that reveals how race remains both idea and object for human population biologists, an indication that it is premature to accept the existence of a no-race consensus across the disciplines. DNA forensics research also demonstrates ways in which race is reified by scientists by the representation of what is cultural or social as natural or biological, and of what is dynamic, relative, and continuous as static, absolute, and discrete. The philosophical analysis of foundational concepts of human population biology such as population, race, and ethnic group is best served by foregoing traditional objectivist approaches for a critical stance that recognises the inextricability of the biological and the social.

1 Introduction

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. The races biologists once claimed to have discovered in nature were, in actuality, the illegitimate offspring of an invented classification scheme they had imposed on nature.

Philosopher of biology Robin O. Andreasen ([1998], [2000]) has recently taken on this consensus view by arguing that biological races do exist. Biological races, she contends, are clades or monophyletic groups: 'they are ancestor-descendant sequences of breeding populations, or groups of such sequences, that share a common origin' ([1998], p. 214). Andreasen is understandably concerned to address possible racist implications of her work. She believes that the cladistic concept of race she defends is socially innocuous and even compatible with social constructionist views.

Andreasen's position deserves to be taken seriously. As I have argued elsewhere (Gannett [2001]), contemporary biology is *not* altogether without a concept of race. The evolutionary synthesis of the 1930s and 1940s and the rise of population genetics redefined race, with biologists substituting a statistical population-based concept for typological understandings of race. Nevertheless, I believe that Andreasen's account is mistaken. From a scientific viewpoint, there are methodological, empirical, and conceptual problems. From a philosophical perspective, the assumption of dichotomies between science and society, facts and values, nature and culture, and the biological and the social has unacceptable ontological and epistemological ramifications.

My criticisms extend beyond the specifics of Andreasen's account, however. Andreasen's approach is typical of the uncritical stance that philosophers of science often assume vis-à-vis the scientific discipline whose conceptual foundations are of interest to them. Due to the rapid pace at which practices in human population genetics are changing and data on population differences are accumulating, and given the problematic nature of foundational concepts such as population, race, and ethnicity, there is an acute need for critical philosophical inquiry at this time. Similarly, other humanists and social theorists need to look more warily on the deference they have shown to biologists over the past number of decades on questions concerning race. This deference reflects the longstanding consensus that the typological and essentialist concepts of race that prevailed during the late-eighteenth, nineteenth, and early-twentieth centuries are invalid, and has led to a lack of critical attention to current practices.

Biological permutations of race persist, founded in the statistical population-based concept of race bequeathed by the evolutionary synthesis. The field of DNA forensics provides a good example of how race remains idea and object for natural scientists. Adopting a critical philosophical approach to the foundations of human population biology that rejects ontic and epistemic dichotomies between the biological and the social, I argue that Andreasen's cladistic, and alternate geographic or genetic, concepts of race constitute an illegitimate biological reification of race in their representation of what is cultural or social as natural or biological, and of what is dynamic, relative, and continuous as static, absolute, and discrete.

2 Consensus view: biological races do not exist

There appears to be widespread agreement among contemporary race theorists that race was an ideological invention of late-eighteenth-century science. Race served to justify the continued exploitation of colonised peoples by Europeans, especially the enslavement of Africans, at a time when Enlightenment thinkers also called for the freedom and equality of 'all men'. Numerous sociologists and other theorists have argued that race may be a *biological* fiction, but it describes a genuine *social* phenomenon. Using the language of social constructionism, Lawrence Blum represents this position as the 'current consensus' among academics:

> I want to make it clear that I join the current consensus in regarding *race* as a scientifically invalid concept, and one that is misleading in ordinary discourse because it tends to imply the validity of some scientific notion of *race*. However, the notion of a racial group is meant to denote a group whose historical and social experience is/has been shared by being regarded as a "race" and treated as such. This definition confers a certain social and historical reality on the notion of *race*, but makes it clear that such a concept can be understood only as a socially constructed one, not a biologically authentic one. (Blum [1999], p. 261; italics in original)

Blum treats the concept of biological race *and* racial groups themselves as socially constructed—idea and object respectively.[1] On the one hand, the social construction of the concept of biological race is the basis for demonstrating its inauthenticity. On the other hand, the social construction of the racial group is the basis for establishing its reality.

There are ongoing philosophical debates concerning the social reality of race and whether it is ethical or practical to retain race as a social category. Parties to these debates, however, are in complete agreement that race is a biological fiction. They may argue over whether races are social kinds but there are no arguments over whether races are natural kinds. Race theorists frequently appeal to the authority of biologists, usually population geneticists, in asserting the non-existence of biological races.[2] Such appeals are consistent with historical accounts. In *The Idea of Race in Science*, Nancy Stepan argues that 'race science' disappeared forever when anthropology was incorporated

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[1] Ian Hacking's *The Social Construction of What*? is a handy reference for beginning to sort out various social constructionist claims. Hacking identifies three kinds of placeholders that can stand in for the 'what': objects that are 'in the world' such as experiences, relations, material objects, and substances; ideas, where these include concepts, beliefs, attitudes, theories, or classifications; and facts, truth, reality, and knowledge—what he calls 'elevator words' ([1999], pp. 21–2).

[2] Zack ([1993]) relies on geneticists Theodosius Dobzhansky, L. C. Dunn, and N. P. Dubinin. *Not in Our Genes*, written by Rose, Lewontin and Kamin ([1984]), is cited by Gilroy ([1987], p. 41), and *The History and Geography of Human Genes*, written by Cavalli-Sforza, Menozzi and Piazza ([1994]), is cited by Sundstrom ([2002]).

into the evolutionary synthesis in the 1950s, and transformed by the concepts and methods of population genetics. In *The Retreat of Scientific Racism*, Elazar Barkan argues that scientists rejected race as a biological category once they came to realise over the first half of the twentieth century that racial classifications are inevitably subjective and arbitrary. According to Barkan, race persists now only as 'a social category which refers to a supposedly recognizable entity based on primordial biological properties' ([1992], p. 3). This means that socially-constructed ideas of race and socially-constructed races as objects should be matters of academic discussion only in areas like cultural anthropology, sociology, philosophy, cultural/multicultural studies, literature, or history.

Certainly, the evolutionary synthesis of the 1930s–1940s and the rise of population genetics discredited notions of race that prevailed in late-eighteenth-, nineteenth-, and early-twentieth-century natural history and biology. Once Darwinian ideas took hold, and it was recognised that populations are always evolving and changing in their genetic composition, races could no longer be conceived as permanent, static entities. Knowledge of Mendelian inheritance demonstrated that genes for 'racial' characters—like skin colour, hair form, or nose shape—are not transmitted together from parents to offspring but recombine. Biologists and anthropologists discovered that choosing different 'racial' traits to use for classification resulted in quite different classifications, without the covariation of traits that would be expected of natural kinds. Empirical evidence that genetic variability is statistically distributed across the species put essentialist ideas about race well to rest. If there are no genes that are present in all members of particular racialised groups and only in these individuals, there are no racial essences. And, with the amount of genetic variability that exists within groups, it makes no sense to talk about typical members of populations or definable racial types. Population thinking, with its emphasis on the extents to which populations are genetically heterogeneous and genetic differences among populations are quantitative or relative not qualitative or absolute, replaced typological thinking as the accepted way to conceive of species' biological diversity.

Elsewhere, I have argued that it might be more appropriate to say that race was redefined, not eliminated from biology, at the time of the evolutionary synthesis, with a statistical population-based concept of race substituted for typological understandings of race (Gannett [2001]). Theodosius Dobzhansky, architect of the evolutionary synthesis and founder of the field of the genetics of natural populations, explicitly sought to reconceive races as populations instead of as types—specifically, as genetically distinct breeding populations. Certainly, any biological race concepts that persist in such fields as zoology, human population genetics, evolution, biological anthropology, medical genetics, or DNA forensics can hope for legitimacy only if they depart from the discredited ideas of race that prevailed through the early twentieth century. These typological and essentialist approaches sought to classify people racially, based on similarities and differences in certain 'essential' intrinsic properties—skull shape, skin colour, blood type, and so forth. Racial kinds were kinds of people. In contrast, the statistical, population-based approach conceives of races as kinds of populations, not kinds of people.

This exemplifies the modern synthesis treatment of populations, no less than organisms, as ontological individuals.[3] If populations are ontological individuals, the logical relationship between organisms and populations is that of parts to wholes, and not that of individual membership in sets, classes, or kinds on the basis of shared intrinsic properties. Populations are constituted by group-level or relational properties. Dobzhansky's ([1950a]) concept of Mendelian population emphasises breeding relations among organisms at the species level and below; at the species level, David L. Hull ([1965]) emphasises genealogical relations among organisms, and Michael T. Ghiselin ([1969]) emphasises competitive relations among organisms. That organisms belonging to the same population tend to exhibit similar genetic characteristics is *because* of the causal effects of these relations, that is to say, these characteristics reflect shared ancestry and common evolutionary history.

Questions about the biological reality of race need to be asked in a way that is consistent with developments in twentieth-century evolutionary biology and population genetics and rejects an understanding of race that is typological and essentialist. The appropriate question is whether there are human populations, or collections of human populations, that are races. It is not about the existence of races as biological classes or sets of individuals—that is, as natural kinds of people.

3 Andreasen's defence of the biological reality of races as clades

Robin O. Andreasen ([1998], [2000]) argues that cladistics furnishes a scientific concept of race. This defence of biological race needs to be taken seriously. Andreasen recognises that the appropriate question concerning race is about natural kinds of populations and not natural kinds of organisms. Andreasen's cladistic account of race conceives races as 'historical individuals'. Race is a dynamic, not static, category: races come into and pass out of existence. Races are constituted on the basis of genealogical relations among populations of organisms, and not similarities in the intrinsic properties of organisms.

The cladistic approach to classification is usually reserved for taxonomic groups at the level of species and above (genera, families, etc.). Andreasen sees

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[3] Along these lines, the thesis that species are individuals has been defended by Ghiselin ([1966], [1974]) and Hull ([1976], [1978]).

the introduction of cladistic analysis for use in racial, or subspecific, classification as consistent with these other areas of systematics where 'shared history has largely replaced similarity as the foundation of a [sic] objective classification scheme' ([2000], p. S657). She offers what she considers to be a biologically objective definition of race: 'Races are monophyletic groups; they are ancestor-descendant sequences of breeding populations, or groups of such sequences, that share a common origin' ([1998], p. 214). Andreasen argues that this cladistic concept of race is objective because it simply describes the evolutionary history of a species in terms of a phylogenetic tree whose branches represent the subdivision of ancestral breeding populations into multiple descendant breeding populations. Taxonomic racial divisions are objective because they represent a process of evolutionary branching that has taken place 'independently of human classifying activities' ([2000], p. S656).

Andreasen believes that the cladistic concept of race is socially innocuous and in no way supports racism. One reason rests in the fact–value distinction:

> Statements about biological differences are descriptive; they are statements of empirical fact. Assertions of racial superiority are normative claims that are born out of social and political motives. They are the result of imposing a value system upon the fact of biological variation, and this value system has no intrinsic relationship to biological diversity itself. ([1998], p. 216)

On this view, scientists simply discover value-neutral, 'objective' biological differences among human groups; biological racism involves the superimposition of value judgements on these biological differences by non-scientist racists. A second reason Andreasen believes that the cladistic concept of race she defends is socially innocuous is that it is compatible with social constructionist projects and aims. She argues that social constructionists have arrived at the mistaken belief that biological races do not exist because they assume that objective classifications must be based on similarities, and ignore the possibility that race might be defined historically ([2000], p. S656). To acknowledge the biological reality of cladistic races need not invalidate social constructionist claims that at least some race-concepts and race-objects are socially constructed. Andreasen drives a wedge between science and society that renders biological and sociological studies of race compatible by distinguishing between the ideas of race and race-objects particular to each. Popular ideas about race, she says, *are* socially constructed. Folk concepts consider races to be static groups whose members share similar traits. The cladistic concept recognises that the category of race is dynamic and that races are constituted on the basis of genealogy, not similarity. *This* concept of race, Andreasen argues, *is* objective. Andreasen mentions evidence that folk and scientific categories of race cross-classify: for example, while 'Caucasians' and 'Africans' are cladistic races, 'Asians' are not. Cladistic races and socially-constructed races are not identical objects. Andreasen concludes that realist biologists and social constructionists can proceed happily in tandem along their separate paths, guided by their different interests—biologists in 'objective reality' and sociologists in the role which 'ordinary' people's common beliefs, even errant ones, play in society ([2000], p. S661).

From a scientific viewpoint, there are several problems with Andreasen's account, methodological, empirical, and conceptual. Methodologically, the cladistic approach focuses on the genealogical relations that exist among *groups*. Breeding groups are the basic taxonomic units. A single breeding group counts as a race at a given time if it is reproductively isolated from all other populations at that time *and* it has been reproductively isolated from all other groups at all times throughout its evolutionary history. A number of breeding groups can be classified as belonging to the same taxonomic race on the basis of genealogical relations if they are descended from a common ancestral population, if their evolutionary history since this initial separation has been purely branching, and if all lineages that connect the groups to the common ancestral population have been reproductively isolated throughout. Thus, the cladistic concept of race and its treatment of breeding populations and groups of breeding populations as discrete entities constantly diverging in time and space require the maintenance of extensive reproductive isolation. The cladistic approach no doubt makes sense when used for species and higher taxa because of the reproductive isolation that is involved with speciation. It is certainly a theoretically possible portrayal of human evolutionary history. The hypothesis would have humans subdivided into relatively small populations that are substantially reproductively isolated from each other, such that they gradually diverge genetically from one another due to mutation, drift, and selection. Migration would for the most part involve the settlement of uninhabited territory by small groups. These conditions do not have to hold universally, but unless they are true for most populations belonging to the species at a given time, and throughout extensive periods of human evolutionary history, cladistic classification of subspecific groups would seem pointless.

Andreasen assumes that these conditions have been fulfilled ever since populations of *Homo sapiens* migrated 'out of Africa' some 50,000 to 100,000 years ago, at least until the period of European conquest and colonisation. The claim that biological races exist, or at least have existed until recent times, is based in empirical contingency not conceptual possibility, but as such, it lacks the necessary empirical support. The phylogenetic tree constructed by L. Luca Cavalli-Sforza, Paolo Menozzi, and Alberto Piazza does not provide evidence for the plausibility of Andreasen's account in the absence of independent means of demonstrating that the qualitative divisions between populations and groups of populations represented by branches of the tree have not simply been imposed on human evolutionary history. Alan R. Templeton notes that 'computer programs used to generate "trees" from genetic distance data will do so regardless of what evolutionary factors generated the distances' and criticises researchers like Cavalli-Sforza for taking for granted that genetic distance data have the 'properties of treeness' ([1998], pp. 638–9). The construction of phylogenetic trees assumes the validity of the 'candelabra model' of human evolution that characterises races as branching lineages. But there are other possible models. Templeton favours the 'trellis model', which assumes that gene flow has always occurred among the world's populations, preventing evolutionary branching, and therefore the formation of races, from taking place. John H. Moore argues that the 'human species is best considered as a fabric, not a mosaic', and that population-based approaches should be abandoned altogether and replaced by a geographic approach that investigates the spatial distribution of genes across the entire 'fabric' of the species ([1996], p. 226). Andreasen's defence of the biological reality of race seems premature given the deficiency of empirical data that could decide between these or other possible theoretical models. Hopes for eventual success may similarly be frustrated. One reason is the underdetermination of theory by evidence. Another is that these models are not mutually exclusive: it is likely that *Homo sapiens* has evolved quite differently in its various parts over time. Unless it can be definitively established that phylogenetic branching has been overwhelmingly prevalent, cladistics provides a questionable basis for racial classification.

There is a related conceptual issue. The cladistic approach to classification presented by Andreasen depends on the existence of branching lineages and reproductive isolation for its success. Yet, at the same time, there is encouragement to treat populations as discrete entities, and therefore simply to assume branching and reproductive isolation, because definitions of 'race' and 'breeding population' focus on relations between groups, not organisms. We have seen that Andreasen conceives of races in terms of genealogical relations among groups, that is, as 'ancestor-descendant sequences of breeding populations, or groups of such sequences' ([1998], p. 214). She also characterises a breeding population in terms of reproductive relations between groups, not organisms, as 'a set of local populations that exchange genetic material through reproduction and are reasonably reproductively isolated from other such sets' ([2000], p. S659). As local populations are the basic constituents of breeding populations, organisms fall way below the radar screen. As mentioned already, other definitions of 'population' recognise these groups to be constituted by relations between organisms—whether these are genealogical ties, competitive interactions, or mating propensities that bind organism-parts into population-wholes. Focusing attention on the inter-organismal relations that are constitutive of breeding and/or genealogical units makes it possible to appreciate that such definitions are relative. Organisms in the same breeding population are more likely to find a mate within the group than outside it. Organisms in the same genealogically-defined population share a greater number of common ancestors than do those in other such groups. It is overwhelmingly the case that populations must be statistically defined; only very exceptionally are their boundaries discrete instead of fuzzy.

From a philosophical perspective, for both ontological and epistemological reasons, Andreasen's defence of the biological reality of race is problematic in its maintenance of rigid dichotomies between science and society, facts and values, nature and culture, and the biological and the social. Adherence to dichotomies between nature and culture and the biological and the social creates an ontological perspective that restricts the causal questions that might be asked. There is no room to inquire about ways in which biological and social forces interact in the structuring of human groups. Andreasen focuses on the historical divergence of populations that occurs through migration, followed by genetic isolation, drift, and natural selection. This resembles zoological approaches in that the emphasis is on the genetic differentiation in space that is associated with physical obstacles to interbreeding. There is no engagement at all with ways in which human evolution is structured by cultural influences on reproductive choices, or migratory patterns. Geographically-isolated 'aboriginal populations' are presented as examples of persisting races, but other endogamous groups are ignored. This naturalistic approach to the study of human evolution runs the risk of perpetuating colonialist myths about people with, and people without, culture. It also ignores that the extent to which physical structures like mountain ranges and rivers really do serve as barriers to gene exchange is always a function of the cultural significance that neighbouring communities attach to them and the effort they are prepared to put into traversing them.[4]

Andreasen's extrications of nature from culture and biology from society have epistemological as well as ontological ramifications, in her contention that scientific facts are value-free. She concludes one article with the strongly-worded claim that 'the cladistic concept falls outside of the race constructivist's appropriate domain of inquiry' ([2000], p. S665). Andreasen believes that the cladistic concept of race is objective because it simply describes the

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[4] Geographical features like rivers and mountains are only potential obstacles to travel. Whether they truly do serve as barriers depends on the cultural meanings that attach to them. In November 1993, when Bosnian Croats demolished the Ottoman-era bridge that spanned the Neretva River in Mostar, it was a symbolic act of tremendous importance. The bridge was a symbol of Bosnian unity; for the past 400 years it had linked the city's Muslim and Christian sides. This is a particularly dramatic example, but the ability of people to build bridges or boats makes such cultural forces a constant feature of human evolution. The tendency of scientists to conceive of indigenous groups in the Andes as *natural* and the Bosnian Croats or Bosnian Muslims as *cultural* groups is surely a western prejudice.

phylogenetic branching pattern that has occurred in human evolution, and this exists quite independently of our representational activities. I do not believe that this philosophical approach to science, and especially human biology, is at all tenable. Social epistemologists, feminist philosophers of science, science studies scholars, and historians of science have provided convincing critiques of these traditional empiricist assumptions. For instance, Helen E. Longino ([1990]) focuses on the under-determination of theories by evidence, and the room this leaves for various sorts of values to play a role in choosing between hypotheses with similar empirical support. The methodological and epistemological problems that under-determination poses for evolutionary biology and population genetics are well known.[5] An appropriate epistemological framework should recognise that knowledge of human evolutionary history is produced in a pragmatic context of investigation in which some sets of theoretical, technological, social, and cultural preferences are inevitably going to be privileged over others. Andreasen assumes that phylogeny is transparent to us and that pragmatics enters only in choosing the time-level at which to describe the 'races'. However, there is no 'objective' description of a human phylogenetic tree that is not the product of making socially-situated and historically contingent choices.

Phylogenies need not be constructed for populations. Some phylogenetic research in *Drosophila pseudoobscura* has attended instead to chromosomes (Gannett and Griesemer [forthcoming a], [forthcoming b]). The choice to reconstruct human evolutionary history at the level of populations rather than chromosomes reflects a curiosity about group origins that is socially situated and historically contingent. To construct a phylogeny of populations, the first step is to delineate present-day populations and provide a genetic description of these groups in terms of the relative frequencies of DNA variants at different loci. It is the extent of the DNA differences between these groups that provides measures of *genetic distance*, by which means estimated times of divergence and degrees of relatedness are arrived at. The validity of assumptions of 'treeness' aside, there is no value-neutral way to delineate the boundaries of present-day populations and to discover the evolutionary relations that hold between them. The biological criteria for identifying the populations that are the basic units of phylogenetic classification are breeding or genealogical relations. The relative, rather than absolute, nature of these relations leaves room for socially and historically contingent choices about where discrete boundaries are placed. Nor are breeding and genealogical relations decisive as biological criteria. 'Treeness' requires as basic units of

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[5] See Lewontin ([1974]) for discussion of the under-determination of the drift and selectionist hypotheses, and Lewontin ([2000]) for discussion on problems posed by under-determination when DNA data from contemporary populations are used to address questions about the historical operation of evolutionary forces.

classification populations characterised by persistence, or spatio-temporal cohesion, without a history of reticulation. This supports a notion of genetic purity where some populations are understood to be unmixed and *relatively* homogeneous. But there is no scientific reason not to be interested in the evolutionary history of populations with a reticulate, rather than branching, past. Judgements of persistence themselves are anchored by privileging particular moments in evolutionary history. Researchers like Cavalli-Sforza focus on populations which they define as *indigenous*, that is *in situ* prior to European colonisation; in contrast, in *Drosophila pseudoobscura* research, populations are composed of whatever flies reside in an area at the time they are sampled (Gannett and Griesemer [forthcoming a], [forthcoming b]). That knowledge of the details of human evolutionary history is accessible to us only by way of presently available DNA data and group categories represents an obvious epistemological limit. Inevitably, those moments in our past deemed significant by those who author narratives about human evolution will direct the writing of this history—a history that is written for and about groups for whom there exists an interest in such a history.

4 Biological permutations of race

News coverage of the 26 June 2000 White House press conference to announce the (near) completion of the sequence map of the human genome and again subsequent to publication of the sequence data in *Nature* and *Science* in February 2001 mentioned hopes that the genetic similarity found to exist across the species would put an end, for once and for all, to claims of the scientific respectability of race. In President Clinton's words:

> I believe one of the great truths to emerge from this triumphant expedition inside the human genome is that in genetic terms all human beings, regardless of race, are more than 99.9 percent the same. [. . .] The most important fact of life on this earth is our common humanity. (White House [2000]).

J. Craig Venter, founder and CEO of Celera Genomics, the biotech startup that launched the sequencing race for the human genome against the publicly funded project, confirmed: 'the concept of race has no genetic or scientific basis' (White House [2000]). Factual evidence that genetic variation within human groups far exceeds genetic variation between groups and that, from an evolutionary perspective, the dispersal of human groups from Africa is relatively recent, with greater genetic variability found in populations inside than outside Africa, robs race of any scientific legitimacy. According to evolutionary anthropologist Svante Paabo: 'From a genetic perspective, all humans are therefore Africans, either residing in Africa or in recent exile' (in Anonymous [2001]). The conclusion, for Venter, is that '[r]ace is a social concept, not a scientific one' (in Angier [2000]).

These statements appear to challenge my earlier claim that biology is not without a race concept, that race was not eliminated from biology at the time of the evolutionary synthesis but redefined, with a statistical population-based concept replacing a typological, essentialist concept. In one sense, the contradiction is only apparent. What biologists mean when they say 'race' varies from one scientist to another and one discipline to another, and depends on the context in which the remarks are made and to whom they are addressed, for example whether at a public or a professional forum. But, in another sense, the contradiction reflects disarray in the conceptual foundations of human genome research. Of late, there is increasing recognition among geneticists that, despite their public disavowals of the scientific legitimacy of notions of race and ethnicity, these concepts have not disappeared from biology, and there are problems with them that are to be confronted. Francis S. Collins, director of the National Institute for Human Genome Research (NIHGR), makes reference to the 'hard position' that human genome scientists find themselves in concerning genetic definitions of race and ethnicity. According to Collins, geneticists must face squarely the need to reconcile two apparently conflicting positions. On the one hand, geneticists contend that race and ethnicity have no scientific basis because within-group variation exceeds between-group variation. On the other hand, geneticists often target specific ethnic groups to investigate genetic factors in disease because of this between-group variation (Anonymous [Reuters newsagency], [2001]).

It is the populational concept of race that justifies and sustains the conflicting positions Collins mentions. The evolutionary synthesis and rise of population genetics saw a dynamic, statistical, population-based concept of race replace an outmoded static, essentialist, and typological one. Theodosius Dobzhansky's *Genetics and the Origin of Species*, one of the foundational texts of the evolutionary synthesis, emphasises that 'what is essential about races is not their state of being but that of becoming' that 'racial differences are more commonly due to variations in the relative frequencies of genes in different parts of the species population than to an absolute lack of certain genes in some groups and their complete homozygosis in others,' and that '[t]he fundamental units of racial variability are populations and genes, not the complexes of characters which connote in the popular mind a racial distinction' ([1937], pp. 61–3). Physical anthropologist M. F. Ashley Montagu sought to replace the term 'race' with 'ethnic group', and yet conceived of ethnic groups as genetically distinct populations:

> An ethnic group represents one of a number of populations, comprising the single species *Homo sapiens*, which individually maintain their differences, physical and cultural, by means of isolating mechanisms such as geographic and social barriers. These differences will vary as the power of

> the geographic and social barriers, acting upon the original genetic differences, vary. ([1942], p. 44)

Generally, human population biologists have failed to engage, from a critical perspective, intersections between the concepts of population, race, and ethnicity that lie at the foundations of their discipline. As noted, many biologists publicly disavow the scientific validity of race. Such pronouncements have been interpreted widely as legitimating the claims of social scientists and humanists that there are no biological races and that the concept of race, and races if assumed to exist, must be understood as socially constructed. But in their disavowals of race, biologists tend to have a very specific concept in mind: a typological race concept that posits essential and fundamental biological differences among human groups. Little attention has been paid to the populational concepts of race and ethnicity introduced at the time of the evolutionary synthesis, and the extent to which social connotations of racial and ethnic differences are embedded in these categories. Non-mainstream scientists and scientific theories have provided convenient support for a social dynamic among biologists that discourages reflexive critique. The biological mainstream is able to portray itself as non-racist and even anti-racist by condemning as racist researchers at the margins of the discipline such as Arthur Jensen, J. Philippe Rushton, and Charles Murray and Richard Herrnstein for the dubious methodologies employed in their studies of race, IQ, and behaviour. The multi-regional hypothesis which is supported by a minority of scientists has also been criticised as racist for suggesting that continentally-distributed biological differences have a longer evolutionary history than what is portrayed by the rival 'out of Africa' hypothesis.

This is not to say that there has been a complete absence of criticisms of race that do not construe race as typological and essentialist and do not rely on the alleged racism of marginal scientists or theories. Some arguments against the existence of biological races in *Homo sapiens* do properly conceive of populations as the possible candidate referents for 'races.' These arguments focus on the arbitrariness that would be involved in drawing racial divisions at any level above that of the local population or panmictic unit. This is because of continuities in patterns of genetic differentiation in space and/or genetic divergence over time. In *The History and Geography of Human Genes*, L. Luca Cavalli-Sforza, Paolo Menozzi, and Alberto Piazza, taking a genealogical rather than a geographic approach as befits their interest in human evolutionary history, point out that continuities in genetic divergence over time make it equally arbitrary to draw racial divisions at any particular horizontal time slice: 'we can identify "clusters" of populations and order them in a hierarchy that we believe represents the history of fissions in the expansion to the whole world of anatomically modern humans. At no level can clusters be identified with races, since every level of clustering would determine a different partition and there is no biological reason to prefer a particular one' ([1994], p. 19). In *Not in Our Genes*, Stephen Rose, R. C. Lewontin, and Leon J. Kamin note that population geneticists at the time of the evolutionary synthesis retained a biological concept of race, that of a 'geographic race' which they define as 'a population of varying individuals, freely mating among each other but different in average proportions of various genes from other populations' ([1984], p. 120). This is basically Dobzhansky's breeding population concept of race. Rose, Lewontin, and Kamin criticise the arbitrariness that is involved in deciding that a particular degree of differentiation in space is sufficient to count as *racial* given that *all* breeding populations differ from one another, at least slightly, in genetic composition. Neighbouring villages, no less than populations from different continents, would have to be counted as 'geographic races.'

By conceiving of races as monophyletic lineages, Andreasen successfully responds to the objections made by Cavalli-Sforza, Menozzi, and Piazza to defining races genealogically. On Andreasen's account, the number of races that exist depends on the specifics of the branching process that has occurred during evolutionary history and is not constant but varies between time levels. At any given time level, since these clades comprise a nested hierarchy, there is a variable but determinate number of monophyletic lineages that biologists, depending on their research interests, might single out as races. However, as I have already argued, there are a number of problems with Andreasen's approach to defining biological races as clades. As for the 'geographic race' concept, while Rose, Lewontin, and Kamin are critical of the arbitrariness that is involved in representing some particular degree of genetic differentiation among populations as racial, Dobzhansky viewed this same arbitrariness as a positive feature of his account. This is because the continuities in the magnitude of genetic differences among populations, in proceeding from neighbouring villages all the way to continental groups, serve to emphasise that race is a dynamic process. On Dobzhansky's account, *all* genetically distinct breeding populations are races, *even* neighbouring villages. Hence, like Andreasen's account, there is an assumption that a determinate number of races exists at any particular time, although the actual number of races that are delineated *as* races varies depending on the research interests of biologists. This reflects Dobzhansky's characterisation of race as a 'dual concept': 'A race is [...] a category of classification which is used for the pragmatic purpose of making a catalogue of the varieties of mankind' *and* '[a] race is [...] a biological population which exists regardless of whether a classifier describes it or not' ([1951], p. 660).

Biologists are in agreement, however, that the basic units of evolutionary change are populations that are more or less isolated from one another by geographic or, in humans, cultural boundaries. Over time, these barriers to interbreeding lead to the gradual genetic differentiation of populations within a species. This corresponds to Dobzhansky's idea of race as a dynamic process. What is controversial is whether the populations or groups of populations that are the products or substrates of this process, differentiated in space or diverging over time, can be termed 'races.' And such controversy can be avoided. What their predecessors referred to as 'racial' or 'ethnic' differences, contemporary population geneticists are likely to call 'population' or simply 'group' differences. It certainly makes sense that a definition of 'race' as *any* genetically distinct population would facilitate its own demise, given that the far less controversial and more technical-sounding 'population' could so easily substitute for it. But this exchange of terms does not mean that the race concept introduced at the time of the evolutionary synthesis disappeared as well. And the plasticity in the concept of race accompanied by terminological equivocations and inconsistencies may obscure the extent to which even earlier ideas of race—associated with imperialism, colonialism, and racial apartheid and segregation and their legacy of racism—persist among biologists.

Those philosophers who recognise that population biologists retain a concept of races as genetically distinct breeding populations tend to downplay its significance concerning racism. Naomi Zack, for example, accepts the breeding population concept of race because it is not essentialist:

> *The scientific racial unit is the breeding population as a whole and not any individual within the population.* All individuals within a race do not have the same racial characteristics. The racial differences between any two individuals within a race may be greater than the racial differences [...] between some individuals within that race and some individuals within another race. [...] In logical, causal terms, there are no necessary, necessary and sufficient, or sufficient racial characteristics, or genes for such characteristics, which every member of a race has. ([1993], p. 14; italics in original)

It seems to me, though, and I have argued this previously, that population thinking is not *necessarily* nonracist or anti-racist (Gannett [2001]). Racist ends do not *require* absolute and essential group differences; statistical group differences and average group tendencies may be pressed into service as well. It is true, though, that such worries about biological racism might be shed were it the case that the entities biologists refer to as 'breeding populations' do not overlap at all with those entities nonbiologists regard as races. This seems to be K. Anthony Appiah's view:

> I have no problem with people who want to use the word 'race' in population genetics. [...] The trouble is that [...] while there are human populations that are and have been for some time relatively reproductively

> isolated, it is not plausible to claim that any social subgroup in the United States is such a population. In *this* sense, then, there are human races, because there are human populations, in the geneticists' sense, but no large social group in America is a race ([1996], p. 73; italics in original).

But the problem is that geneticists *do* treat these 'large social groups' as 'human populations,' and it is important that the scientific and societal implications of such practices not be ignored. In *The Genetics of Human Populations*, L. Luca Cavalli-Sforza and Walter F. Bodmer reject Dobzhansky's definition of race as *any* genetically distinct Mendelian population but consider 'black and white Americans' to be sufficiently reproductively isolated to count as races. Incredibly, social structure is ignored, and the 'racial barrier' is explained in terms of 'psychological factors' that react against 'striking outward differences' in 'facial appearance and skin color' ([1971], p. 490, p. 793).[6] Daniel Hartl, in *Our Uncertain Heritage: Genetics and Human Diversity*, considers 'tribes of Indians' and 'major human races' alike to be 'contemporary populations' and *any* genetically distinct population to be a race ([1985], p. 367).[7]

Current genetics research into ethnic correlates of disease and DNA forensics similarly treats OMB (Office of Management and Budget) census groups in the U.S. as genetically significant populations. Consider the field of DNA forensics. The U.S. Congress, in passing the 'DNA Identification Act of 1994', authorised the FBI to develop a computer system to link DNA data banks that are maintained at the local, state, and national levels. CODIS (Combined DNA Index System) was activated in 1998 and contains a number of indices: the 'Convicted Offender Index', the 'Victims Index', the 'Forensic Index', the 'Unidentified Persons Index', the 'Missing Persons Index', and the 'Close Biological Relatives Index'. At present, CODIS DNA profiles include 13 STR (short tandem repeat) loci (Budowle et al. [1998]). Besides these six CODIS indices, the FBI maintains a 'Population File' that details relative frequencies of particular alleles in different racial/ethnic populations. These data are currently used to estimate the statistical probability of matches of evidence and suspect DNA within specific racial/ethnic groups, in recognition of population substructuring in *Homo sapiens*: 'Although there is more

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[6] A 1999 reissue of this classic text makes no changes to these sections on race, and in his introduction, Cavalli-Sforza indicates that the conceptual foundations of the discipline remain essentially unchanged since 1971.

[7] There are other problems too. One is that we often think of racism as a phenomenon that is broader than what involves only the major racially-defined groups—for example, anti-Semitism, ethnic cleansing in the former Yugoslavia and Rwanda, discrimination against the Roma, and so forth. Another is that these smaller population units which geneticists consider to be races *do* correspond to social groups that are defined linguistically, culturally, or nationally—for example, Amish, Irish, and Cherokee. This means there is a potential for statistical DNA differences to be represented as socially significant for at least some groups.

variability within groups than between the means of different groups, allele frequencies between groups differ enough that separate databases have been developed for Caucasian Americans, African Americans, Hispanic Americans, and Asian Americans' (National Commission [2000], p. 16). The statistical analysis that is carried out to establish profile frequencies proceeds on the assumption that these groups are large, randomly-mating populations in linkage equilibrium that can be tested to see if they are in Hardy-Weinberg equilibrium. Thus, in DNA forensics research, population geneticists seem to be carrying on quite contrary to Appiah's remark that, on the breeding population concept of race, 'no large social group in America is a race.'[8]

There is an additional aim associated with the FBI's ongoing compilation of data on group DNA differences for its population databases. The ability to identify the probable racial/ethnic origin of an unknown suspect on the basis of DNA evidence found at the crime scene is anticipated for the near future. The 13 STR loci presently used by CODIS apparently allow the racial identities of suspects to be 'predicted' (these identities conform to the groups already mentioned—'Caucasian American', 'African American', 'Hispanic American', and 'Asian American'). Aided by sequence data provided by the Human Genome Project, population-based genetics research (some of which is funded by the U.S. Department of Justice) is expected to isolate new DNA markers that will permit more accurate 'predictions' of racial/ethnic origins. A recent report on the future of DNA forensics commissioned by the U.S. Department of Justice includes the following statement: 'Beyond the use of additional STR and mtDNA loci, SNPs and Alu markers are expected to be well defined for use in determination of ancestral geographic origin' (National Commission [2000], p. 29).

The report's assumption that any DNA sample has a determinate and determinable 'ancestral geographic origin' amounts to the claim that all of us belong to racial and/or ethnic groups. It suggests, as well, that there is a truth about our racial and ethnic identities that is located in our genes, a biological identity card that trumps any social group affiliations we may have. This is entirely consistent with a certain interpretation of the

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[8] This is similar to the use biomedical researchers make of these categories in studies that identify disease allele frequency differences among populations by sequencing DNA derived from donated blood or biological tissues obtained in clinical settings, where donors or patients have been assigned racial/ethnic identities on the basis of the OMB classification. It is not an unrealistic possibility that biomedical researchers would eventually be permitted access to blood samples provided by offenders, given that few states have placed specific limits on what uses can be made of DNA profiles and stored biological materials (Wisconsin is the only state that destroys blood samples after determining DNA profiles; the other states retain blood samples 'indefinitely'). Like blood donors and hospital patients, offenders are racially classified, and this attaches racial labels to their DNA profiles and blood samples. One can imagine the extension of population-based research to fields such as behavioural genetics; no doubt researchers who think they will discover a 'criminal gene' are rolling up their sleeves in eager anticipation.

breeding-population concept of race inaugurated by the evolutionary synthesis which assumes that populations, and therefore races or ethnic groups, are well-defined biological objects and that racial/ethnic identities are absolute. Although geneticists recognise that it is possible to ascertain an individual's racial/ethnic identity only probabilistically, they assume this is so because genetic variability is statistically distributed across populations, and not because populations themselves are statistically defined with racial/ethnic identities consequently being indeterminate. As Dobzhansky wrote:

> [T]he probability that an individual taken from a given population will carry a given gene may be either greater or smaller than it would be for an individual from another population. [...] By and large, the more traits examined in an individual, [...] the more precisely can be inferred the part of the world from which these individuals come. ([1950b], pp. 116–7)

Similarly, Andreasen's case for the biological reality of races as clades supports the commission report's assumption of a typology of racial groups subdivided into ethnic groups that makes it possible to ascertain racial and ethnic group identities of individuals on the basis of DNA samples.

However, these racial and ethnic typologies, across space for Dobzhansky and across time for Andreasen, are illegitimate offspring of the biological reification of race. The biological reification of race occurs in two ways: what is cultural or social is represented as natural or biological, and what is dynamic, relative, and continuous is represented as static, absolute, and discrete.

That the OMB categories, implemented as a social classification system and familiar to U.S. residents from the recent census, are being treated by geneticists as biologically meaningful in areas like DNA forensics and biomedical research is deeply problematic. I argue elsewhere that racial and ethnic groups have social reality where individuals are united by social affiliations or bonds based in ideas of race or ethnicity, for example, shared beliefs or political aims surrounding whiteness or Pan-Africanism, common linguistic or cultural traditions among the Basque or French Canadians, and so forth (Gannett [MS]). Because these relations among individuals that are constitutive of social groups can be more and less binding, racial and ethnic groups vary in the degree to which they form cohesive entities. In contrast, the OMB categories refer to nominal sets (or groupings or collections) of racialised individuals, not genuine social groups (or collectivities). In the absence of social ties among these racialised individuals that would constitute them as social groups, there are certainly no reproductive ties that would legitimate their treatment as breeding populations. Nevertheless, statistical differences in allele frequencies found among racialised classes of DNA samples may be taken to establish the biological validity of the classification by ignoring the invalidity of the null hypothesis that assumes no genetic differences between randomly assigned groups.

Only endogamous social groups—social groups whose constitutive relations include the preference for within-group reproduction—can be regarded as breeding populations from a biological perspective. It is incumbent upon geneticists to develop methodological criteria that distinguish between nominal sets of racialised or ethnicised individuals and social races or ethnic groups, and between endogamous social groups that legitimately can be treated as breeding populations and nonendogamous social groups that it is irresponsible as well as illegitimate to treat as breeding populations. Use of OMB racial/ethnic categories (for example, 'American Indian', 'Hispanic', or 'White') as proxies in biomedical research risks the biological reification of these socially-classified sets of racialised/ethnicised individuals. Nonendogamous social groups (say, Francophone Canadians) risk similar biological reification when used as proxies in biomedical research. Social groups that it may be appropriate to use in biomedical research because they are relatively endogamous (the Amish, perhaps) risk biological reification in a different way when reproductive ties become conceived of as wholly biological rather than as always also, and primarily, social. In treating endogamous social groups as breeding populations, it needs to be remembered that reproductive ties among humans are primarily social, and only secondarily biological. Where DNA markers are used to 'predict' a person's racial/ethnic group identity, this is still a social group identity. There is no asocial nature composed of primordial biological groups that scientists discover.

Any method of biological classification that shares with the U.S. Justice Department report, Dobzhansky, and Andreasen the assumptions that everyone belongs to a population, race, or ethnic group, and that no one belongs to multiple populations, races, or ethnic groups, errs by imposing false typologies onto complex realities. These typologies are false not because they are based on an essentialist concept of race that wrongly assumes the existence of qualitative racial differences among human individuals in terms of intrinsic properties like DNA markers or, more traditionally, skin colour, hair form, or facial characteristics. These typologies are false because they wrongly impose qualitative boundaries onto continuous patterns of social and biological relationships among people. The endogamous social groups that can be treated legitimately from a biological perspective as breeding populations are statistically defined, with individuals belonging to these groups to greater and lesser degrees. Reproductive ties involve propensities: two individuals will be more likely to mate with one another than with some third individual. Similarly, genealogical relations are matters of degree: two individuals will share a greater number of common ancestors than either does with some third individual. Given that it is these bonds among people that are constitutive of any such groups, it is evident that populations, races, and ethnic groups vary in their degree of cohesiveness, and that associated population, racial, or ethnic group identities may be indeterminate and/or multiple, with people belonging to more than one group and to any single group as a matter of degree.[9] This indeterminacy is unlikely to have arisen only in recent times, and this casts doubt on Andreasen's defence of the biological reality of race in terms of clades, because defining races as historical individuals assumes extensive reproductive isolation for most of *Homo sapiens* during its evolutionary past. The naturalism this approach assumes arbitrarily bounds more and less ephemeral social groups and then reifies these as discrete biological entities.

5 Conclusion

This is a period of rapid change in fields of human population biology. DNA data on human group differences are accumulating rapidly as the result of the Human Genome Project and advances in genotyping technologies. As just one area of research in which race remains both idea and object for natural scientists, DNA forensics demonstrates ways in which a confluence of social and biological factors operates in the scientific construction of race concepts and racialised groups. We need to achieve a better understanding of how social and biological forces interact in the production of human genetic diversity, how socio-historical contexts determine the conceptual frameworks biologists use to represent this diversity, and how biological differences are involved in the dynamic and contingent construction of social identities. Addressing these problems necessitates the rejection of rigid dichotomies—both ontic and epistemic—between the social and the biological.

Philosophers of science often take an uncritical approach to the scientific discipline that is the focus of their analysis. The philosophical aim is to establish the validity of the scientific discipline's knowledge claims by furnishing objective definitions of its foundational concepts. The task of locating objective definitions for foundational concepts in the sciences is made possible by the philosopher's adherence to a number of dichotomies: facts and values, science and society, nature and culture, the social and the biological. Adopting this approach to the foundations of science, as is the case in Robin O. Andreasen's cladistic defence of race, no doubt has its place. But disarray in the conceptual foundations of human genome diversity research—recall the 'hard position' mentioned by Francis S. Collins (Anonymous [Renters news-agency], [2001])—demands more of us philosophically.

Historical ties between concepts of population, race, and ethnic group in human population biology suggest that ideas about racial and ethnic

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[9] I develop these criticisms of the concept of population in 'Making Populations: Bounding Genes in Space and in Time' (Gannett [forthcoming]).

differences that are prevalent in society are likely to influence the constitution of patterns of DNA variability as population differences. At the same time, in the representation of populations as wholly biological objects, the influence of these ideas is hidden. This points to the importance of the critical role for the philosopher of science at this juncture. If there are conceptual foundations to be buttressed, they need first to be subjected to critical scrutiny. Otherwise, our best philosophical efforts risk contributing to the biological reification of race.

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