



CHICAGO JOURNALS



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Source: *Philosophy of Science*, Vol. 70, No. 5, Proceedings of the 2002 Biennial Meeting of The Philosophy of Science Association

Part I: Contributed

Papers Edited by Sandra D. Mitchell (December 2003), pp. 1161-1172

Published by: [The University of Chicago Press](#) on behalf of the [Philosophy of Science Association](#)

Stable URL: <http://www.jstor.org/stable/10.1086/377397>

Accessed: 05/06/2013 23:39

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On the Concept of Biological Race and Its Applicability to Humans

Massimo Pigliucci and Jonathan Kaplan[†]

Biological research on race has often been seen as motivated by or lending credence to underlying racist attitudes; in part for this reason, recently philosophers and biologists have gone through great pains to essentially deny the existence of biological human races. We argue that human races, in the biological sense of local populations adapted to particular environments, do in fact exist; such races are best understood through the common ecological concept of ecotypes. However, human ecotypic races do not in general correspond with 'folk' racial categories, largely because many similar ecotypes have multiple independent origins. Consequently, while human natural races exist, they have little or nothing in common with 'folk' races.

The nature of biological species is a moral issue only for those people who ground human rights in human nature.

—David Hull, 1998

It has become commonplace to claim that, insofar as “race” is a biological concept, there are no human races. This claim, while widely defended, is misguided. We maintain that careful attention to the uses of “race” in nonhuman biology reveals ways that biologically meaningful human races might exist. While we argue that there likely are a variety of identifiable and biologically meaningful human races, these will not correspond to folk racial categories, nor will the fact of their existence offer any support to racist views. While the study of (human) races is of interest to biologists, that study will have little or no consequence for our understanding folk racial categories or racism. Indeed, because the folk conception of human races is well-entrenched, politically and socially loaded, and does not for the most part align with the biological uses, we suggest that avoiding the

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Philosophy of Science, 70 (December 2003) pp. 1161–1172. 0031-8248/2003/7005-0025\$10.00
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term “race” with respect to the human case would be advisable in order to prevent confusion.

1. What Are Biological Races? For a concept that is allegedly in disuse in biology (Futuyma 1998), an awful lot of papers in the nonhuman biological literature have been published in the last five years which include the term “race” in their title or abstract. Exploring the way that “race” is currently used within the context of nonhuman biology is therefore a crucial first step to determining whether there are biologically meaningful human races. Indeed, many of the current arguments against the existence of biologically meaningful human races fail precisely because they rely on a use of the biological race concept that is not, in fact, in wide circulation.

King and Stansfield’s dictionary of genetics (King and Stansfield 1990) defines race as: “A phenotypically and/or geographically distinctive subspecific group, composed of individuals inhabiting a defined geographical and/or ecological region, and possessing characteristic phenotypic and gene frequencies that distinguish it from other such groups. The number of racial groups that one wishes to recognize within a species is usually arbitrary but suitable for the purposes under investigation.” Darwin ([1859] 1910) had considered races as subspecies; as Darwin saw species as fairly fluid entities, subspecies had therefore to be even more labile a fortiori. King and Stanfield also connect “race” to “subspecies”—in their dictionary defined as “1. A taxonomically recognized subdivision of a species. 2. Geographically and/or ecologically defined subdivisions of a species with distinctive characteristics.” Notice that the second definition is essentially the same as the one given above by the same authors for race. The actual biological literature, however, is much more ambiguous about the relationship between races and subspecies.

Given such confusion, it is instructive to briefly consider how practicing biologists actually use the term race and how they relate it to subspecies. The following examples are far from a complete survey of the literature, but they are representative of recent papers on the biology of races in animal and plant systems. Some authors explicitly link the “race” concept to speciation: for example, Rehfeldt and Gallo’s (2001) work on races of Douglas fir makes the concept out to have both an ecological and cladistic component, and Jiggins et al. (2001) expressly links races to the speciation process in two butterflies. However, Vicente et al.’s (2001) work on *Xanthomonas campestris* (a bacterial pathogen that infects plants of the genus *Brassica*) makes race out to be about particular ecological adaptations, not population origin. Similarly, Stone et al. (2001) studied the differential success in northward expansion of two ecotypes of marble gallwasps, one attacking the turkey oak, the other the cork oak; while the

racess do not represent independent linages, the transition between them was found to be abrupt in both ecological and genetic terms, and, while hybridization of the two forms has been detected, Stone et al. consider these two entities as good example of races.

Races, then, can be defined and picked out in a number of ways. Several ways of picking out races will likely overlap because of the nature of biological organisms; for example, if a population is ecologically distinct (e.g., it lives at high elevations) it is also likely to be geographically isolated (by virtue of occurring in a location at high elevation) and to be somewhat genetically differentiated. But while genetic and phenotypic differences between local populations will often be associated with phylogenetic distinctiveness, such differences do *not* imply phylogenetic distinctiveness, nor, a fortiori, do they imply incipient speciation. For a lineage to acquire phylogenetic distinctiveness, gene flow with other closely related populations must essentially cease. If gene flow is still significant, the lineage is evolving according to a reticulate, not cladistic (branching) pattern. While it is still possible for such an entity to maintain ecological distinctiveness (see below), its historical roots are continuously reshuffled by migration events. Thus, while ecogeographical-genetic differentiation tend to correlate with each other they do *not* imply cladogenesis and speciation, though the latter two are themselves associated.

That biologically meaningful races do not have to be phylogenetically distinct is obvious when we consider the case of ecotypes. The concept of ecotype was introduced by Turesson (1922) to describe genetically based specific responses of plants to certain environmental conditions, although the idea has been applied to the animal literature as well. The King and Stansfield's dictionary defines an ecotype as a "Race (within a species) genetically adapted to a certain environment." It is important to understand three things about ecotypes: (1) there must be a connection between genetic differentiation and ecological adaptation, (2) ecotypes are not (necessarily) phylogenetic units; rather, they are functional-ecological entities, and (3) ecotypes can be differentiated on the basis of many or a very few genetic differences.

These facts about ecotypes have several important implications. Similar ecotypic characteristics can and do evolve independently in geographically separated populations (see McPeck and Wellborn 1998). These similar phenotypic characteristics may, or may not, be mediated by similar genetic differences from other populations of the species (see Schlichting and Pigliucci 1998, 142–146, and cites therein). Further, gene flow between different ecotypes is relatively common (see Futuyma 1998, and cites therein); if there is sufficient selective pressure to maintain the genetic differences associated with the different adaptive phenotypes, other genes, not so associated, may flow freely between the populations. Further,

because different ecologically important characteristics are not guaranteed to coincide, a single population can consist of multiple overlapping ecotypes. In such cases, whether two organisms belong to the same ecotype will depend on *which* ecotype one is referring to.

These points will become particularly important when we discuss why we think that insofar as there might be human races of biological interest, these will best be thought of as ecotypes. Many of the arguments that conclude that there are no human races depend upon definitions of race at odds with the ecotype interpretation. It is through the ecotype concept that biologically interesting and significant human races may well be discoverable.

2. Human Races: Definitions and Problems. Given the variety of ways in which “race” is used in the biological literature, it is hardly surprising that a significant element of the debates surrounding the existence of biological *human* races is the particular definition of “race” used. Indeed, some authors have argued against the existence of biologically significant human races by suggesting that there is no acceptable “race” concept in biology more generally (e.g., Futuyma 1998). However, as noted above, the vagueness of the biological race concept does not prevent its useful application in many areas of nonhuman biology. The question is not whether biological “races” exist; rather, it is which biological race concepts can be most usefully applied to human populations.

Insofar as one considers appeals to biological races to be attempts to pick out incipient species, it seems perfectly clear that there are not currently any human “races.” There are no extant populations of our species that are plausible candidates for being incipient species. Further, the current distribution of genetic variation within *H. sapiens* implies that at no time in the past were any of the (currently extant portions of the) population evolving independently (see Templeton 1999 and cites therein). While the *Homo* genus very likely generated incipient species during its history (and perhaps even full-fledged separate species), none of these currently survive (see Tattersall 1998 and cites therein). The evolution of contemporary *Homo sapiens* was likely *not* marked by populations that at one time had independent evolutionary trajectories but exist today as part of the larger population (Rogers 1995; Templeton 1999; Waddle 1994).

Rather, human evolution seems to have been marked by extensive gene flow. While this implies that there are not now, nor ever were, biologically significant human races that corresponded to populations that had been phylogenetically separate for some significant period of time (contra Andreasen 1998), it does not imply, as some authors have argued, that there can be no significant biological races in humans. As we saw

above in the case of ecotypes, adaptive genetic differentiation can be maintained between populations by natural selection even where there is significant gene flow between the populations. Templeton (1999), for example, notes that gene flow sufficient to ensure that distinct populations evolve together as a single species is compatible with the populations having distinct, genetically mediated, phenotypic adaptations. For example, he notes that there are populations of *Drosophila mercatorum* in Hawaii that “show extreme differentiation and local adaptation” yet have significant gene flow between them.

Lewontin and Gould have made much of the fact that there is relatively little genetic variation in *Homo sapiens* (compared at least to other mammals; see Templeton 1999) and that most of what genetic diversity is known to exist within *Homo sapiens* exists within (rather than between) local populations (see, for example, Gould 1996; Lewontin et al. 1984), and these facts are cited repeatedly in arguments concluding that there are no biologically significant human races. But the idea that this data might imply something about the existence of biologically significant human races emerges from a focus on the wrong sort of biological races. The relative lack of genetic variation between populations compared with within population samples does imply that the populations have not been reproductively isolated for any evolutionarily significant length of time. But of course, this fact is *irrelevant* for the consideration of races based on adaptive variation; in this case, if there is extensive gene flow, genetic variation can be mostly within groups, rather than between groups, as variations not related to the adaptive phenotypic differences between the populations will be spread by gene flow relatively easily. The question is not whether there are significant levels of between-population genetic variation overall, but whether there is variation in genes associated with significant *adaptive* differences between populations (see our discussion in Kaplan and Pigliucci 2001).

So, if we conceive of races similarly to the way ecotypes are conceived of, it is clear that much of the evidence used to suggest that there are no biologically significant human races is, in fact, irrelevant. As long as differences between populations can be maintained because of their adaptive significance, races can exist despite extensive gene flow between populations. The questions, then, are as follows: Do such conditions exist in the human case? and: Did such conditions exist during the course of human evolution such that the resultant differences might still be detectable today (though perhaps no longer actively maintained)?

Before addressing those questions, it is worth taking a short detour to consider *why* so many authors writing about the (non)existence of human races have made use of such a strong definition of race (i.e., assumed that biologically significant races must be populations separated from other

populations by serious barriers to gene flow). Part of the reason undoubtedly has to do with the history of the term “race” as it is applied to humans. Insofar as one is asking a question not about the existence of biologically significant races (of the sort that exist in certain species of *Drosophila*, for example) but rather about the existence of a biological justification for the “ordinary” language racial categories, the concept of race appealed to will have to be quite strong. As, for example, Appiah (1996) and Hull (1998) point out, the races colloquially appealed to are generally supposed to differ from each other not merely in one particular adaptive trait, but in *many* traits simultaneously (a kind of racial “essentialism” and, as Hull notes, a throw-back to typological thinking). Knowing someone’s (biological) race, on this view, would permit one to make accurate predictions about a wide range of traits they possess—as Keita and Kittles put it, that “visible human variation connotes fundamental deep differences within the species, which can be packaged into units of near-uniform individuals” (1997, 534). This, however, will likely be impossible if there is little systematic between-population genetic variation compared to variation within the populations in question, and is in any event biologically unrealistic. Very few if any species have subpopulations that form groups of that sort, and the search for such groups seems to be a holdover of pre-Darwinian typological thinking (Futuyma 1998). So while the amount and distribution of genetic variation is largely irrelevant to the question of whether a species is divided into biologically significant races generally, it *is* relevant to the question of whether “ordinary” conceptions of folk racial categories in humans have any biological support, and to this question there is a broad consensus that the answer is “no.” Biology, it has been rightly noted many times, cannot underwrite the sort of racial concepts that have usually been applied to humans.

This answer, though, is often mistakenly thought to imply that there are no biologically significant human races at all, or at least that folk races must be utterly unrelated to biologically interesting human populations. While it seems clear that biologically meaningful races will not correspond particularly well to folk racial categories, this does not imply that folk racial categories are completely orthogonal to biologically meaningful racial categories. However, insofar as there is evidence that biologically significant human races exist, that evidence points towards *most* biologically meaningful human races being quite a bit smaller (and far more numerous) than are folk races; the idea that those groups picked out by folk races and those populations that form biological races will not, in general, correspond is therefore likely correct. And of course, as has already been noted, insofar as folk races are supposed to pick out populations that systematically differ from each other over a wide range of genetic and phenotypic measures, biology provides no support for the existence of

such populations (and indeed, provides evidence that no such populations exist).

Confusion about these points is rampant, and far too much of the literature surrounding the biological basis, or lack thereof, of human races misunderstands these points. To take a trivial example, consider the controversy surrounding Entine's book *Taboo: Why Black Athletes Dominate Sports and Why We're Afraid to Talk about It* (2000). While we agree with the critics who stress the dearth of hard data to support some of Entine's specific claims (Hoberman 2000), our main concern with the debate is that, as Michael Shermer notes, Entine's evidence, even taken at face value, does not support the contention that *blacks* dominate sports at all (Shermer 2000). Rather, even if all that Entine claims is true, the only conclusions that can be drawn are that smallish particular populations generate the athletes that dominate *particular* sports. In other words, as even Entine admits, "blacks" are not better runners—rather, some West African black populations produce more world-class sprinters than the proportion expected from their population size and the assumption of random distribution of athletic talents among humans would generate, and Kenya (especially the Nandi region) similarly produces far more than its share of great marathon runners. It is certainly possible that these regional differences in the production of top athletes reflect regional differences in athletic ability (or, better put, differences in physiology more generally), and it is even possible that these differences are the result of local adaptations to particular environmental (including perhaps long-term cultural) pressures. If this is so, on an ecotypic conception of race, there would in fact be "races"—and indeed, races associated with athletic ability.

However, what one must remember is that the races in question do not, in this scenario, have much to do with folk races. If instead of phrasing the issue in terms of "race," Entine had put it in terms of local adaptations within smaller populations (ecotypes), his book would likely have been seen as far less controversial. Further, the sorts of evidence necessary to support his conclusions would have been far more obvious as well. Just as one can gather evidence that particular ecotypes of the mustard-like weed *Arabidopsis* have the particular features they do in virtue of the particular selective pressures they've been under (e.g., Pigliucci and Byrd 1998), so too could one gather evidence in the case of human ecotypes (albeit with all the usual problems of ethical and practical restrictions on human experimentation, etc.).

None of this should come as a surprise. The issue is not, as Gould and others have been fond of claiming, that skin color is only "skin deep" but rather that "skin color" is an ecologically important—not a phylogenetically significant—trait. If skin color had evolved only once, such that

populations with different skin colors formed at least partially monophyletic populations, we would expect to find many other phenotypic differences associated with differences in skin color; some would be the result of different selective regimes, but some would no doubt be the result of, for example, drift. The reason that skin color is not well correlated with other phenotypically important features is, at least in part, that skin colors evolved independently several times, and often evolved in populations that were not genetically isolated from other populations (Diamond 1997)—similar skin color therefore represents not a shared ancestry but rather similar selective pressures. The only thing that fair-skinned people share is that, at one time or another, their ancestors lived in an area with low levels of sunlight and ate a diet poor in vitamin D. As there were many such areas and many such times, fair skin says little or nothing about phylogeny.

But while skin color is not well correlated with other phenotypic traits of interest in humans, there is, despite Gould's claims (Gould 1996) to the contrary, no guarantee that particular populations of humans will not, due to particular features of their environment, share particular distributions of adaptive behavioral (including intellectual) traits, as opposed to simple physical traits. To the best of our knowledge, there is no evidence that such populations exist, nor are there reasons to suppose that such populations *must* exist. Given the difficulty with testing hypotheses regarding the adaptive significance of behavioral tendencies in humans *simpliciter* (Lewontin 1998), the lack of evidence for behavioral (and/or intellectual) ecotypes in humans is not surprising. But it is intellectually dishonest to move from the lack of evidence for such differences to claiming that there is evidence for an absence of such differences, a move all too often made (oddly enough, both by Gould and by some of his opponents in "evolutionary psychology" (see, for example, Gould 1996, Tooby and Cosmides 1990)). The conviction that there are no such populations emerges not from research or principled arguments, but rather, we suspect, from fear that to even suggest the existence of such populations is to fall into the worst sort of racist thinking.

This is unfortunate. The study of the relationship between adaptive traits in humans and expressed behaviors is difficult enough without these limitations. Indeed, if there is any systematic variation in adaptive behavioral traits between human populations, discovering and studying such variation might provide one of the best entries into the study of human behavioral traits as adaptations more generally. Many of the most obvious problems with discovering and testing adaptive behavioral traits in humans are at least much less severe with respect to traits that vary systematically between human populations (see Kaplan 2000). Obviously this is very speculative: Again, there is no evidence that such populations exist, and if they do, discovering them and properly testing the adaptive hypotheses

may yet prove impossible given our limited ability to test adaptive hypotheses regarding humans more generally. But looking for such variation does not commit one to racist thinking; the populations displaying such variation would very likely *not* correspond closely to folk races.

3. Overlapping Adaptions, Clinal Variations, and Human Races. Some authors have argued from the existence of sizable populations with phenotypes intermediate between those associated with particular folk races to the conclusion that there are no biologically significant human races (see, for example, Keita and Kittles 1997). But this is just what we would expect to find if these ecotypic races are sometimes clinal in nature. A cline is a pattern of gradual variation of one or more characters, usually—but not exclusively—along a latitudinal or altitudinal range. Again, gene flow can be extensive through clines, as long as selective pressures are sufficient to maintain the genetic differences associated with adaptations to the ecologically important conditions (e.g., Jordan et al. 2001, Futuyma 1998). Given the wide geographical distribution of human populations over evolutionarily significant periods of time (Templeton 1999), it would be surprising if human populations did not show any clinal variation in ecologically important characteristics. The key points made above regarding ecotypes—that they may or may not be phylogenetic units and may or may not limit gene flow—also hold true for clinal variations, as does the observation that an individual may simultaneously be a member of multiple different ecotypes (as in multiclinal variation).

Of course, this implies that insofar as we focus on an ecotype conception of race, there will not necessarily be a unique “race” to which any given member of a population belongs. Any given individual may in fact belong to a number of different ecotypic races, and/or be a member of one (or more) intermediate population(s) within a (series of) clinal distribution(s). However, this is hardly an unexpected complication in a discipline like biology, characterized by a high level of complexity of both the object of study and the conditions that induce variation in that object.

The problem posed by clines, then, is no different from that posed by any other gradual transition, and provides no reason to reject the possibility of the existence of biologically significant human races. Similar problems, after all, face any definition and practical application of the concept of species itself; nonetheless, biologists have not given up the use of that most controversial biological category just yet (Howard and Berlocher 1998).

4. Ecotypes and Folk Races. As we have seen, insofar as biologically meaningful races are conceptualized as populations more like ecotypes than like incipient species, many of the arguments purporting to show that there are no human races miss their mark. While in nonhuman biology the

term “race” has been and is being used in a variety of ways, the best way of making sense of systematic variation within the human species is likely to rely on the ecotypic conception of biological races. In this sense, there are likely human races (ecotypes) of biological interest. But again, biology provides no support for the very strong, essentialist-style conception of “race” that has, both historically and at present, underwritten racism (of both the individual and institutional varieties), and indeed, biology reveals that the assumptions underlying such a conception of race are false.

This does not, of course, imply that our folk conception of race is not significant—while it does not pick out populations of *biological* interest, it does pick out populations of deep social and political interest. These populations do not, in fact, have many of the features they were historically supposed to have, but that does not prevent the application of the folk concept of race. Nor, we believe, should it. As long as the folk racial category to which one happens to belong is systematically related to other important aspects of one’s life, there is obviously still a need to pay attention to race in formulating, for example, social policy. And, it need hardly be said, it is. In the U.S., and in at the very least many other contemporary societies, one’s (folk) race is systematically related to one’s chances of acquiring most (if not all) important goods—everything from education to money to self-respect.

While it is valuable for biologists to note that the essentialist conception of human races has no support in biology whenever particular claims are made that seem predicated on such a conception (e.g., Herrnstein and Murray’s 1994 work on race and intelligence), they should not fall into the trap of claiming that there is no systematic variation within human populations of interest to biology. Studying human ecotypes could yield insights into our recent evolution, and perhaps shed increased light onto the history of migrations and gene flow. To some extent, this is already happening (see Cavalli-Sforza et al. 1994, etc). However, the ambiguity surrounding definitions of “race” and the politically charged atmosphere surrounding race in humans has hampered research into these areas, a situation from which neither biology nor social policy surely benefit.

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