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Book review

Human natures — A review of *The 10,000 Year Explosion*
G. Cochran and H. Harpending

With 2,400 years of hindsight, it seems unlikely that Plato's eternal, immutable Forms actually exist. No one believes, for example, that all chairs are merely shadows cast by a literal, eternal Chair, apprehensible only to the intellect. When it comes to living organisms, however, including Homo sapiens, Plato's concept of Forms still has some traction. Genes, like Forms, are more or less immutable and only indirectly perceptible, yet they appear to encode the essence of what it means to be a human. Because genes vary, they also raise the unsettling specter of distinct African, Asian, and European essences, or natures, a specter that has hobbled investigation of the genetic basis of human behavior for decades.

Refreshingly, this specter exerts remarkably little hold on Cochran and Harpending (C&H) (Cochran, G, and Harpending, H., 2009). C&H vigorously attack several orthodoxies of modern human genetics that were laid out, in large part, by Richard Lewontin and Stephen Jay Gould, who hoped to banish the menacing biological legitimization of racism. Lewontin (1972, p. 381), for example, opened his hugely influential paper on human genetic variation with an allusion to Plato's Forms, noting that some viewed human variation as "distorted shadows" of an ideal. Implicitly, Lewontin seemed to accept, or maybe dread, that genes are akin to essences, for he went to great lengths to argue that most human genetic variation, about 85%, is among individuals, and very little, 15%, is between groups. The implication is that between-group genetic variation is relatively minor, and hence "race," in Lewontin's words, has "ceased to be seen as a fundamental reality characterizing the human species" (Lewontin, 2006).

In a similar vein, Gould (2000) argued that "natural selection has almost become irrelevant in human evolution. There's been no biological change in humans in 40,000 or 50,000 years." The "races," in other words, could not have evolved apart from one another after humans' relatively recent dispersal out of Africa.

According to C&H, Lewontin made two critical mistakes. First, although between-group genetic variation might only represent a small fraction of the total, it might nevertheless play a disproportionately important role in the phenotype. C&H claim that about 70% of genetic variation in dogs is within breeds, and 30% between breeds, yet no one would conclude that there are no important differences between Great Danes and Chihuahuas. In principle, most within-group variation in humans could be genetic noise, whereas most between-group variation could be a consequence of selection on populations, adapting them to different local environmental conditions.

Second, it turns out that genetic variations are correlated. For example, whereas any particular allele at a single locus would say little about where one's grandparents lived, correlations among thousands of alleles can pinpoint the birthplace of one's grandparents to within a few hundred kilometers (Novembre et al., 2008; see also Lao et al., 2008). Theoretically, there could be correlations among alleles at many loci that, in concert, produce large between-group differences in phenotypes, as even Lewontin admits is the case for a suite of covarying traits that include skin color, hair form, nose shape and some proteins (Lewontin, 2006). These arguments form one line of attack by C&H on modern biological orthodoxy.

C&H also attack the belief, held by Gould and many others, that natural selection could not have produced much change in the human genome in the 10,000 years since the transition from a hunter–gatherer to an agricultural way of life. Agriculture posed numerous novel reproductive challenges involving, among other things, diet, disease and large settlements. In addition, the population explosion which accompanied the transition to agriculture would have dramatically increased the number of mutations upon which selection could act. C&H argue that these two factors accelerated the pace of recent human adaptive evolution about 100-fold compared to the long-term average (see Hawks, Wang, Cochran, Harpending, & Moyzis, 2007). According to C&H, the humans of today differ *in essence* from even our relatively recent ancestors and, at the population level, from each other.

What evidence do C&H marshal for these claims? What are the implications for human history? And what are the implications for evolutionary theories of human behavior?

Many examples of recent, advantageous, population-specific alleles offered by C&H will be familiar, such as those underlying lactose tolerance, malaria resistance and the effects of skin color on UV protection and vitamin D synthesis. Many other examples will be new, though, and that is because they are essentially pure speculation, based on the slightest of genetic hints, and sometimes on nothing more than C&H's intuition. With the rise of agriculture, for

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example, came the rise of elites. C&H argue that the elites did not just dominate peasants but genetically domesticated them, "cull[ing] individuals who were more aggressive than average" (p. 111), which would have led to a tamer population overall. The evidence? Low frequencies of the 7R allele of dopamine receptor DRD4 in East Asia. The 7R allele is associated with ADHD and, hence, might cause increased aggression in adults. Considering that the effect of 7R on ADHD is small (Faraone, Doyle, Mick, & Biederman, 2001), the argument, as presented, is shaky at best. (For a bit more, see Harpending & Cochran, 2002. An alternative hypothesis is that 7R, which appears to have been positively selected, promotes a tendency to migrate; Chen, Burton, Greenberger, & Dmitrieva, 1999).

In contrast to hunting and gathering, where being lazy and living for the moment supposedly made biological sense, C&H claim that agriculture selected for individuals who were "more selfish, hardworking [and] self-denying" (p. 117). The evidence? C&H provide none. Agriculture also apparently selected for traits, such as mastering new social and technical developments, that enable people to engage successfully in trade. The evidence? South Americans, descended from folks who became agriculturists only recently, are experiencing a current wave of discontent with liberal economic policies, whereas Armenians, Jews, Lebanese and Southeast Asians, all descended from long-established agricultural populations, are successful "middleman minorities" (pp. 117–119). That is not remotely convincing. Based on mtDNA evidence, C&H also claim that the Etruscans added Middle Eastern, agriculture-adapted alleles into the Roman mix, asking, "Did [these alleles] influence Rome's rise to power?" All C&H offer is "It's possible" (p. 144).

It would be tempting, on the basis of so many unsupported and often questionable assertions, to dismiss C&H. Elsewhere, though, they provide a defense that they should have provided here: "Whereas tests of hypotheses ought to be careful and conservative, generation of hypotheses ought to be speculative and free-ranging. There is a tradition of caution approaching self-censorship in discussions of human biological diversity…." (Harpending & Cochran, 2002). I completely agree.

Although Lewontin, Gould and many other biologists have repeatedly warned of the dangers of asking certain questions, questions are only dangerous if you fear the answers. The truth, established by rigorous empirical research, will surely be stranger than anyone's speculations, but we will never get to that truth without crossing some politically incorrect ground. The value of C&H is not that they make a convincing case for, well, anything; it is that they raise bold questions about major historical encounters between populations — Neanderthal and modern humans, German tribes and Romans, Europeans and Native Americans — in light of formidable (but not unassailable) arguments from population genetics, pushing the reader to think outside the box. Almost every major historical encounter between two or more distinct populations could be revisited in light of the possibility — possibility — that some genetic advantage in disease resistance, metabolism or, yes, cognition played a key role in the outcome.

What are the implications for evolutionary approaches to the social sciences? Evolutionary psychology (EP), for example, has endorsed and elaborated Lewontin's views about the unimportance of race, proposing that there is a single human nature, comprising a complex, universal, evolved cognitive architecture, and that deep mental differences between human populations cannot exist (Tooby & Cosmides, 1990a,b). Though elsewhere C&H are dismissive of this view (Harpending & Cochran, 2002), here they endorse it, saying, "We think that this argument concerning the evolution of new complex adaptations is correct…." Of course, C&H spend the rest of the book arguing that this "underestimates the importance of simple adaptations, those that involve changes in one or a few genes." The difference between C&H and EP, then, is not over basic facts but instead over what constitutes "importance."

The claim of C&H that has gotten the most press is that Ashkenazi Jews evolved, via natural selection, to be smarter than everyone else. Because C&H have identified the 20 or so specific alleles they think are responsible for the apparent IQ advantages of this Jewish subgroup (Cochran, Hardy, & Harpending, 2005), it is pointless to engage in further theoretical debate. Empirical studies can confirm whether, against the genetic background of the Ashkenazim specifically, and Europeans and everyone else more generally, these alleles explain substantial variance in IQ (the alleles are those that in homozygotes cause diseases such as Tay-Sachs and Gaucher's disease, but which C&H argue provide an IQ advantage in heterozygotes).

I instead want to focus on postweaning lactase persistence (LP), a topic that highlights the "importance" of recent, population-specific adaptations. Tooby and Cosmides (1990a) characterize LP as a "minor" exception to their claim that virtually all adaptations of anatomically modern humans either newly evolved or were maintained by selection during the Pleistocene. C&H argue, in contrast, that the evolution of LP changed the course of human history.

The discussion involves the origins of the Proto-Indo-Europeans, those who spoke the language that eventually evolved into the major languages of Europe, the Iranian plateau and the Indian subcontinent. As their starting point, C&H adopt Marija Gimbutas' influential Kurgan hypothesis, in which nomadic Bronze Age warriors originating in the Eurasian steppe expand both to the west, conquering much of Europe, and to the southeast, conquering much of present-day Iran and northern India.

C&H posit that the key advantage of these Proto-Indo-Europeans was not the chariot or horse, but instead a mutation, the T-13910 allele responsible for LP in most northern Europeans and many northwestern Indians. In C&H's scenario, the mutation appears some 8000 years ago

in a cattle-raising society in the steppe. As the allele spreads, it enables a shift to dairying, which apparently produces five times as many calories per acre as does raising cattle for slaughter, causing the population of these dairymen to explode. Over time, they morph into nomadic pastoralists, who, like pastoralists everywhere, fiercely defended an especially valuable and mobile resource — their herds.

With its large numbers and mobility, the resulting warrior society spread rapidly across the steppe, eventually conquering and dominating, but not exterminating, farming societies in Europe, Iran and India. These Indo-Europeans imposed their language on the conquered farmers but, with exceptions such as T-13910, contributed little to the European gene pool. Similar scenarios might have played out with cattle herders in East Africa and camel herders in the Arabian Peninsula.

Tooby and Cosmides are right that LP represents a minute adjustment to the human blueprint. But assuming, for the sake of argument, C&H are right, LP nevertheless had a huge impact on human history. The debate over the "importance" of complex adaptations that evolved over hundreds of millennia vs. simple adaptations that evolved in less than one has no single resolution. For some scientific questions there are few important differences between humans and yeast, for example, which are both eukaryotic organisms, or between humans and nematodes, which both have nervous systems. For other questions, such as the causes of the Indo-European expansion, a difference in a single nucleotide could be hugely important.

C&H have not unchained us prisoners, leading us out of Plato's cave of shadows into the sunlight, but they have sprung a few of the locks. Their book is very well written, in a style that is easily accessible to undergraduates. Population genetics is clearly explained using simple, clever analogies. The book would be perfect for an advanced undergraduate, or introductory graduate, seminar that might also include Jared Diamond's *Guns, Germs and Steel* and Richard Nisbett's *Intelligence and How to Get It*. It should also be on the summer reading list of all evolutionary social scientists.

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