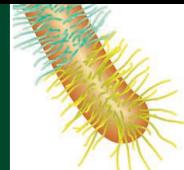


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LETTERS

edited by Etta Kavanagh

Genetics and *The Sopranos*

THE SOPRANOS, THE WIDELY VIEWED HBO TELEVISION SERIES PORTRAYING contemporary Mafia life in New Jersey, recently aired its final episode. Future critics of popular culture who look back on *The Sopranos* years from now may especially appreciate its relatively sophisticated treatment of genetic themes.

By my count, the 86 episodes aired since 1999 include 20 explicit dialogs about genetics. These range from the comical ("Two beautiful kids—you must be proud... yeah, yeah—how about that huh?... Even with our genes.") to the forensic ("cut him up in the work area?... no more of that: DNA.") and the dramatic ("My God—there's nothing holding us together but DNA!").

The most in-depth discussions about heredity occur between the lead character Tony Soprano and his psychiatrist concerning the genetic basis of panic attacks in Tony's family when he discovers that his father suffered from them and that his son does, too ("He has that putrid, rotten [expletive] Soprano gene!").

Most people derive their knowledge of genetics from popular culture (1). *The Sopranos*, therefore, may have already shaped the genetic literacy of millions of viewers. Central questions about the

relative roles of heredity and environment in human behavior can be examined through the attention paid in this series to "family" themes and discussion of familial traits that include depression, panic attacks, and attention deficit disorder, as well as discussions about suicide, criminality, sexual preference, substance abuse, and reproductive cloning. As *The Sopranos* takes its place in the history of American popular culture, its use of genetic dialogs may, in the long run, be recognized as one of its most revealing insights.

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The nuclear Soprano family... celebrating an interesting genetic heritage?

A Less Pessimistic View of U.S. Science Funding

REGARDING J. M. GENTILE'S LETTER "KEEPING the U.S. a world leader in science" (13 July, p. 194), readers would do well to examine my entire address to the AAAS Science Policy Forum (available at www.ostp.gov).

In my talk, I expressed alarm that the nation's research capacity in some fields is outpacing trends in federal research support that have persisted over four decades. It is simply not the case that "the United States has begun to stumble as a world leader in science and technology" or that researchers have been "left high and dry by flat federal funding." We continue to outspend and outperform all other major economies in research, and R&D funding has grown by 56% (from \$91 billion to \$143 billion) since 2001 (1). I certainly agree

with Gentile that the capacity exists to do more, and that is the point. In contrast to the federal discretionary budget, whose limits are increasingly constrained by mandated programs, private-sector investments in research and development tend to grow with the economy. They currently exceed federal R&D by a factor of more than two (2). Research universities and other institutions are already forming innovative partnerships with state and private-sector entities to augment federal research funding, and this will certainly continue. This is a healthy trend that should be encouraged.

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Washington, DC, 2007), Table I-11, p. 59.

- National Science Board, "Science and Engineering Indicators 2006: Highlights—National R&D Trends," vol. 1 (NSB 06-01, National Science Foundation, Arlington, VA, 2006), pp. 4–5.

Evolution and Group Selection

I WORRY THAT SOME PSYCHOLOGISTS, UNFAMILIAR with evolutionary biology, will be misled by J. Haidt's account of "The new synthesis in moral psychology" (Reviews, 18 May, p. 998). Haidt claims that whereas "[h]uman group selection was essentially declared off-limits in 1966," it is now accepted that "groups that develop norms, practices, and institutions that elicit more group-beneficial behavior can grow, attract new members, and replace less cooperative groups" (p. 1001). Although it is certainly true that such things



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"can" happen, Haidt fails to mention that the overwhelming conviction among evolutionary theorists remains that they are most unlikely, since the selection differential between groups would have to exceed the cost differential experienced by self-sacrificial individuals within groups.

By a rhetorical sleight of hand, after describing D. S. Wilson's group-selection hypothesis for the evolution of religion, Haidt then announces—as though it were fact—that "group selection greatly increased cooperation within the group" (p. 1001). This is pure speculation, not fact, and highly controversial, contrarian speculation at that.

In another case of substituting opinion for reality, Haidt proposes his "Principle 4," arguing for the biological legitimacy of "patriotism, respect for tradition, and a sense of sacredness" (p. 1001). Perhaps, in the future, these supposed components of morality will be found to have genuine evolutionary underpinnings, but for now they seem closer to a political platform plank for the religious right; psychologists interested in achieving a new synthesis by applying evolutionary biology to human morality should bear in mind that just because these notions appeared in a *Science* Review does not make them genuine science.

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Response

BARASH IS CORRECT THAT A SURVEY OF ALL evolutionary theorists would show a great deal of skepticism about group selection. That consensus, however, was forged in the 1960s and 1970s on the basis of some simplifying assumptions, most notably that phenotypes are determined solely by genotypes and that culture can be ignored. Models incorporating these assumptions showed that selection pressures operating at the individual level were almost always stronger than selection pressures operating at the group level, leading to the conclusion that genes for apparently altruistic traits can only spread if those genes are in fact "selfish" (1) via one of the two mechanisms of kin selection or reciprocal altruism.

But evolutionary models have become more realistic in recent years. Phenotypes (e.g., cooperator or defector) can now be modeled as joint products of genes, cultural learning, and culturally altered payoff matrices. When culture is included, the old consensus must be reexamined. The time frame shrinks from millennia to years (or less) as groups find culturally innovative ways to police themselves, to increase their phenotypic homogeneity, to lower the costs of prosocial action, and to increase the size of the pie they then share. Just look at eBay: Its genius was to make the prosocial behaviors of gossip and punishment nearly costless through its feedback systems. The eBay community is an emergent group that wiped out many other auction-related groups, without malice or genetic change. If we limit our survey of evolutionary theorists to those who study humans as cultural creatures and who allow for the bidirectional interplay of genetic and cultural evolution, we find the opposite of Barash's view: Most such theorists believe that cultural group selection has occurred and is occurring, and that such selection might well have shaped human genes whenever culturally altered selection pressures remained constant locally over many centuries. In writing my Review, I ignored the old consensus and drew instead on the new and exciting work of leading theorists such as Richerson and Boyd (2), Boehm (3), Fehr (4), Henrich (5), Maynard Smith (6), and Wilson (7), all of whom believe that natural selection works at multiple levels, including the group level.

As for Barash's final point about conservative morality, I do not believe that descrip-

tive biology confers normative legitimacy. In my Review, I identified some areas of moral life that are highly elaborated in most cultures, but that are disliked by political liberals and dismissed by moral psychologists. I suggested that evolution may have shaped our intuitions about in-groups, authority, and purity, just as it shaped our intuitions about harm and fairness. If Barash believes that this suggestion is irresponsible because it may strengthen the religious right, then he has demonstrated the danger of moralism in science and has inadvertently illustrated all four of the principles that I proposed as comprising the new synthesis in moral psychology.

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CORRECTIONS AND CLARIFICATIONS

Reports: "Direct evidence for a parietal-frontal pathway subserving spatial awareness in humans" by M. Thiebaut de Schotten *et al.* (30 September 2005, p. 2226). This study employed a neuroimaging method, diffusion tensor imaging tractography, to identify a fronto-parietal pathway important for spatial awareness. On the basis of the available literature [see, e.g., J. Bossy, *Les hémisphères cérébraux*, Neuroanatomie, Ed. (Springer, Berlin, 1991)], this pathway was labeled as "superior occipito-frontal fasciculus." However, further evidence from the author's laboratory (see Supporting Online Material at www.sciencemag.org/cgi/content/full/317/5838/597/DC1) led them to reconsider this labeling. The authors are now convinced that the pathway likely corresponds to the human homologous of the second branch of the superior longitudinal fasciculus (SLF II), described in the monkey brain by Schmahmann and Pandya [J. D. Schmahmann, D. N. Pandya, *Fiber Pathways of the Brain* (Oxford Univ. Press, New York, 2006)]. In the monkey, the SLF II originates in the caudal inferior parietal lobe (corresponding to the human angular gyrus) and the occipito-parietal area and projects to the dorsolateral prefrontal cortex. This modification does not change the main point of the Report, that damage to the fronto-parietal pathways is important to produce neglect. On the contrary, it renders the results even more consistent with the data reported by Doricchi and Tomaiuolo [F. Doricchi, F. Tomaiuolo, *NeuroReport* **14**, 2239 (2003)], which demonstrated that damage to the SLF in human patients with vascular lesions correlates with the presence of spatial neglect. Future studies on the implication of white matter pathways in human cognition would greatly benefit from a stereotaxic atlas of the white matter tracts in the human brain.

Letters to the Editor

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