

The Mythical Threat of Genetic Determinism

By Daniel C. Dennett*

It is time to set minds at ease by raising the "specter" of "genetic determinism" and banishing it once and for all. According to Stephen Jay Gould, genetic determinists believe the following:

"If we are programmed to be what we are, then these traits are ineluctable. We may, at best, channel them, but we cannot change them either by will, education, or culture."

If this is genetic determinism, then we can all breathe a sigh of relief: There are no genetic determinists. I have never encountered anybody who claims that will, education, and culture cannot change many, if not all, of our genetically inherited traits. My genetic tendency to myopia is canceled by the eyeglasses I wear (but I do have to want to wear them); and many of those who would otherwise suffer from one genetic disease or another can have the symptoms postponed indefinitely by being educated about the importance of a particular diet, or by the culture-borne gift of one prescription medicine or another. If you have the gene for the disease phenylketonuria, all you have to do to avoid its undesirable effects is stop eating food containing phenylalanine. What is inevitable doesn't depend on whether determinism reigns, but on whether or not there are steps we can take, based on information we can get in time to take those steps, to avoid the foreseen harm.

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There are two requirements for meaningful choice: information and a path for the information to guide. Without one, the other is useless or worse. In his excellent survey of contemporary genetics, Matt Ridley drives the point home with the poignant example of Huntington's disease, which is "pure fatalism, undiluted by environmental variability. Good living, good medicine, healthy food, loving families, or great riches can do nothing about it." This is in sharp contrast to all the equally undesirable genetic predispositions that we can do something about. And it is for just this reason that many people who are likely, given their family tree, to have the Huntington's mutation choose not to take the simple test that would tell them with virtual certainty whether they have it. But note that if and when a path opens up, as it may in the future, for treating those who have Huntington's mutation, these same people will be first in line to take the test.

Gould and others have declared their firm opposition to "genetic determinism," but I doubt if anybody thinks our genetic endowments are infinitely revisable. It is all but impossible that I will ever give birth, thanks to my Y chromosome. I cannot change this by either will, education, or culture -- at least not in my lifetime (but who knows what another century of science will make possible?). So at least for the foreseeable future, some of my genes fix some parts of my destiny without any real prospect of exemption. If that is genetic determinism, we are all genetic determinists, Gould included. Once the caricatures are set aside, what remains, at best, are honest differences of opinion about just how much intervention it would take to counteract one genetic tendency or another and, more important, whether such intervention would be justified.

These are important moral and political issues, but they often become next to impossible to discuss in a calm and reasonable way. Besides, what would be so specially bad

about genetic determinism? Wouldn't environmental determinism be just as dreadful? Consider a parallel definition of environmental determinism:

"If we have been raised and educated in a particular cultural environment, then the traits imposed on us by that environment are ineluctable. We may at best channel them, but we cannot change them either by will, further education, or by adopting a different culture."

The Jesuits have often been quoted (I don't know how accurately) as saying: "Give me a child until he is 7, and I will show you the man." An exaggeration for effect, surely, but there is little doubt that early education and other major events of childhood can have a profound effect on later life. There are studies, for instance, that suggest that such dire events as being rejected by your mother in the first year of life increases your likelihood of committing a violent crime. Again, we mustn't make the mistake of equating determinism with inevitability. What we need to examine empirically – and this can vary just as dramatically in environmental settings as in genetic settings – whether the undesirable effects, however large, can be avoided by steps we can take.

Consider the affliction known as not knowing a word of Chinese. I suffer from it, thanks entirely to environmental influences early in my childhood (my genes had nothing -- nothing directly -- to do with it). If I were to move to China, however, I could soon enough be "cured," with some effort on my part, though I would no doubt bear deep and unalterable signs of my deprivation, readily detectable by any native Chinese speaker, for the rest of my life. But I could certainly get good enough in Chinese to be held responsible for actions I might take under the influence of Chinese speakers I encountered.

Isn't it true that whatever isn't determined by our genes must be determined by our environment? What else is there? There's Nature and there's Nurture. Is there also some X, some further contributor to what we are? There's Chance. Luck. This extra ingredient is important but doesn't have to come from the quantum bowels of our atoms or from some distant star. It is all around us in the causeless coin-flipping of our noisy world, automatically filling in the gaps of specification left unfixed by our genes, and unfixed by salient causes in our environment. This is particularly evident in the way the trillions of connections between cells in our brains are formed. It has been recognized for years that the human genome, large as it is, is much too small to specify (in its gene recipes) all the connections that are formed between neurons. What happens is that the genes specify processes that set in motion huge population growth of neurons -- many times more neurons than our brains will eventually use -- and these neurons send out exploratory branches, at random (at pseudo-random, of course), and many of these happen to connect to other neurons in ways that are detectably useful (detectable by the mindless processes of brain-pruning).

These winning connections tend to survive, while the losing connections die, to be dismantled so that their parts can be recycled in the next generation of hopeful neuron growth a few days later. This selective environment within the brain (especially within the brain of the fetus, long before it encounters the outside environment) no more specifies the final connections than the genes do; saliencies in both genes and developmental environment influence and prune the growth, but there is plenty that is left to chance.

When the human genome was recently published, and it was announced that we have "only" about 30,000 genes (by today's assumptions about how to identify and count genes),

not the 100,000 genes that some experts had surmised, there was an amusing sigh of relief in the press. Whew! "We" are not just the products of our genes; "we" get to contribute all the specifications that those 70,000 genes would otherwise have "fixed" in us! And how, one might ask, are "we" to do this? Aren't we under just as much of a threat from the dread environment, nasty old Nurture with its insidious indoctrination techniques? When Nature and Nurture have done their work, will there be anything left over to be me?

Does it matter what the trade-off is if, one way or another, our genes and our environment (including chance) divide up the spoils and "fix" our characters? Perhaps it seems that the environment is a more benign source of determination since, after all, "we can change the environment." That is true, but we can't change a person's past environment any more than we can change her parents, and environmental adjustments in the future can be just as vigorously addressed to undoing prior genetic constraints as prior environmental constraints. And we are now on the verge of being able to adjust the genetic future almost as readily as the environmental future.

Suppose you know that any child of yours will have a problem that can be alleviated by either an adjustment to its genes or an adjustment to its environment. There can be many valid reasons for favoring one treatment policy over another, but it is certainly not obvious that one of these options should be ruled out on moral or metaphysical grounds. Suppose, to make up an imaginary case that will probably soon be outrun by reality, you are a committed Inuit who believes life above the Arctic Circle is the only life worth living, and suppose you are told that your children will be genetically ill-equipped for living in such an environment. You can move to the tropics, where they will be fine -- at the cost of giving up their environmental heritage -- or you can adjust their genomes, permitting them

to continue living in the Arctic world, at the cost (if it is one) of the loss of some aspect of their "natural" genetic heritage.

The issue is not about determinism, either genetic or environmental or both together; the issue is about what we can change whether or not our world is deterministic. A fascinating perspective on the misguided issue of genetic determinism is provided by Jared Diamond in his magnificent book *Guns, Germs, and Steel* (1997). The question Diamond poses, and largely answers, is why it is that "Western" people (Europeans or Eurasians) have conquered, colonized, and otherwise dominated "Third World" people instead of vice versa. Why didn't the human populations of the Americas or Africa, for instance, create worldwide empires by invading, killing, and enslaving Europeans? Is the answer ... genetic? Is science showing us that the ultimate source of Western dominance is in our genes? On first encountering this question, many people -- even highly sophisticated scientists -- jump to the conclusion that Diamond, by merely addressing this question, must be entertaining some awful racist hypothesis about European genetic superiority. So rattled are they by this suspicion that they have a hard time taking in the fact (which he must labor mightily to drive home) that he is saying just about the opposite: The secret explanation lies not in our genes, not in human genes, but it does lie to a very large extent in genes -- the genes of the plants and animals that were the wild ancestors of all the domesticated species of human agriculture.

Prison wardens have a rule of thumb: If it can happen, it will happen. What they mean is that any gap in security, any ineffective prohibition or surveillance or weakness in the barriers, will soon enough be found and exploited to the full by the prisoners. Why? The intentional stance makes it clear: The prisoners are intentional systems who are smart,

resourceful, and frustrated; as such they amount to a huge supply of informed desire with lots of free time in which to explore their worlds. Their search procedure will be as good as exhaustive, and they will be able to tell the best moves from the second-best. Count on them to find whatever is there to be found.

Diamond exploits the same rule of thumb, assuming that people anywhere in the world have always been just about as smart, as thrifty, as opportunistic, as disciplined, as foresighted, as people anywhere else, and then showing that indeed people have always found what was there to be found. To a good first approximation, all the domesticable wild species have been domesticated. The reason the Eurasians got a head start on technology is because they got a head start on agriculture, and they got that because among the wild plants and animals in their vicinity 10,000 years ago were ideal candidates for domestication. There were grasses that were genetically close to superplants that could be arrived at more or less by accident, just a few mutations away from big-head, nutritious grains, and animals that because of their social nature were genetically close to herdable animals that bred easily in captivity. (Maize in the Western Hemisphere took longer to domesticate in part because it had a greater genetic distance to travel away from its wild precursor.)

And, of course, the key portion of the selection events that covered this ground, before modern agronomy, was what Darwin called "unconscious selection" -- the largely unwitting and certainly uninformed bias implicit in the behavior patterns of people who had only the narrowest vision of what they were doing and why. Accidents of biogeography, and hence of environment, were the major causes, the constraints that "fixed" the opportunities of people wherever they lived. Thanks to living for millennia in close proximity to their many varieties of domesticated

animals, Eurasians developed immunity to the various disease pathogens that jumped from their animal hosts to human hosts -- here is a profound role played by human genes, and one confirmed beyond a shadow of a doubt -- and when thanks to their technology, they were able to travel long distances and encounter other peoples, their germs did many times the damage that their guns and steel did.

What are we to say about Diamond and his thesis? Is he a dread genetic determinist, or a dread environmental determinist? He is neither, of course, for both these species of bogeyman are as mythical as werewolves. By increasing the information we have about the various causes of the constraints that limit our current opportunities, he has increased our powers to avoid what we want to avoid, prevent what we want to prevent. Knowledge of the roles of our genes, and the genes of the other species around us, is not the enemy of human freedom, but one of its best friends.