

THE PRICE OF SCIENCE WITHOUT MORAL CONSTRAINTS

German and American Medicine Before DNA and Today

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I want to talk today about the life and works of Dietrich Bonhoeffer. Though not a scientist, but rather a martyred German Pastor of the middle of the previous century, he has a lot to teach us about the necessity of taking a stand in public against egregious misinterpretations of the results of science.

Let me begin with this quotation from Albert Einstein, the greatest scientific mind we have known. When these words were recorded in the autumn of 1940—the season and year of my own birth—he was a German-Swiss émigré to the United States, speaking in English in his exile, to faculty and students at Union Theological Seminary in New York City. Some of these students would have known Bonhoeffer as well, having wished him safe journey a year earlier when he boarded one of the last passenger ships to leave the United States before the outbreak of war, to exchange the safety of Union Theological Seminary for a return to his home and work in the Germany of 1939. Einstein said:

... a religious person is devout in the sense that he has no doubt of the significance and loftiness of those super-personal objects and goals which neither require nor are capable of rational foundation. They exist with the same matter-of-factness as he himself. In this sense religion is the age-old endeavor of mankind to become clearly and completely conscious of these values and goals and constantly to strengthen and extend their effects.

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By the winter of 1940-41, Bonhoeffer had become deeply immersed in a secret plot to kill Hitler. Writing to his friend Bethge about family matters, he let slip a reminder to his friend to read something from the Old Testament, the Torah:

How nice that you were with Johannes yesterday . . . Read Exod.23.7 again.

Exodus 23:7 carries one of the commands that Moses receives at Sinai and passes on to the Children of Israel. It concerns the behavior of judges: “Keep far from a false charge; do not bring death on those who are innocent and in the right, for I will not acquit the wrongdoer.”

So, in the first months of my own life, Einstein—having left his native land to save his life—speaks clearly, in safety, of the religious obligation a scientist must have to serve some cause beyond his or her own needs. At the same time Bonhoeffer—having only a year earlier returned to Germany from the same few square blocks of religious freedom that form Union Theological Seminary—turns to a text that his ancestors and Einstein’s had shared for millennia, to stiffen his resolve and confirm his full resistance to a terrible regime. That regime had not only sent its greatest mind away to exile in the United States, but had also been using science for many years to justify orders to send hundreds of thousands of other Germans from their hospital beds to their deaths.

How could this have happened? My way of answering in this season will be to address three questions, in this order:

Question 1: How could science and medicine collaborate to bring death on “those who are innocent and in the right?” That is, how did the eugenics movement of a century ago result in such a terrible outcome?

Question 2: How may the scientists among us understand our obligation today and in the future, to keep our work “free from a false charge,” even though we may become powerful and wealthy by allowing misuses of the new, DNA-based genetic medicine of today?

Question 3: How may we all meet our obligations today and in the next twenty years, to those who today are least able to care for themselves?

Question 1

In the first part of the last century, the eugenics movement brought together some of the best geneticists and physicians and the worst tin-plate chauvinists in the Western world. It was—and for some people still is—easy to endorse their initial agenda: civilized people have an obligation to minimize the number of defective versions of genes in their chromosomes and in those of their descendants, replacing them with good, better, and best versions.

Some eugenicists, however, were impatient with simple testing and counseling. Would it not be easier to cultivate the best selections of human genes, they asked, if the wasteful, genetically risky business of having children were put under rational control, and easier still if the results of genetic analysis were fed into a state apparatus that would decide who could be born and who not?

It is easy to see—standing on a mountain of ashes, watching world leaders shiver in the snow at the sixtieth anniversary of the liberation of the remnant of survivors of Auschwitz—where the scientists and doctors of Germany went off the deep end. But only twenty years before Hitler came to power, eugenics was a recognized, legitimate branch of genetics, and in Germany, the United States, and many Western countries it drew the attention of reasonable, educated people at the very highest strata of society. Here, for instance, is United States President Woodrow Wilson, writing in his “History of the American People” of the shift in immigration to the United States at the turn of the twentieth century, just as the Eugenics movement was gaining force:

Throughout the [nineteenth] century men of the sturdy stocks of the north of Europe had made up the main strain of foreign blood which was every year added to the vital working-force of this country or else men of the Latin-Gallic stocks of France and northern Italy, but now there came multitudes of men of the lower class and men of the meaner sort out of Hungary and Poland—men out of the ranks where there was neither skill nor any initiative of quick intelligence . . .

Andrew Carnegie, whose free libraries grace New York and many other cities, was a generous and enthusiastic supporter, as well, of the international

eugenics movement. He founded the Carnegie Station for Experimental Evolution at Cold Spring Harbor, Long Island, at the turn of the century. Charles Davenport, the director of the Cold Spring Harbor laboratory in the 1920s, contributed heavily to Congress's decisions in that decade to restrict immigration to the United States on "national" grounds. His testimony before Congress, and that of others, was full of eugenic contentions couched in the most scientific tone; for example, alcoholism, poverty, and avarice were argued to be "genes" inherited by people born of Irish, Italian, and Jewish parents, respectively.

The inaccuracy, intellectual sloppiness, and prejudices of scientists like Davenport and like-minded members of Congress converged in the Immigration Law of 1926, which codified the most crudely racist and biologically foolish distinctions since the Constitution's definition of an African slave as 60 percent of a human being. By the 1940s, this eugenically correct law had blocked the escape to the United States of many people who subsequently died in actions carried out according to the more activist laws of the Third Reich.

Germany was the country most hospitable to the eugenics movement in the 1920s and 1930s. As they thought of ways to accomplish the "weeding and seeding" of human genes, German eugenicists were first assisted, then taken over, by a political movement, a government, and a leader all driven by the crudest and most naive notions of national and racial purity. In that time and place it was only a short walk for many physicians, and for some professors of psychiatry, anthropology, zoology, and genetics, to go from theories of eugenics to the practice of mass murder.

Their downward spiral can be reconstructed from their writings and from the grim record they left behind in other ways. It began with an appreciation of Garrod's discovery that certain inherited differences among people—recessive ones—reappear unexpectedly after generations of silence. It went from there through ambiguous clinical observations that certain mental diseases and physical deformities might be inherited in this way, to acquiescence in the nonsensical notion that some versions of some genes reflected national boundaries and religious distinctions. From there it went to the endorsement of the even more bizarre notion that within a country, a measurable set of versions of genes marked the national "type," so that persons whose appearances, behaviors, cultures or religions revealed their lack of these versions of their genes, could never be brought into the national fold by naturalization, nor by conversion.

From there it became simply a matter of new law, that a life without proper National genes was simply not worth living, and from there it was only obe-

dience to the law that led to participation in the banning of marriage, then the sterilization, and then the murder, of hundreds of thousands of people in Germany presumed—on the basis of such markers as the desires of their heart or a history of epileptic episodes—to lack these versions of genes in their chromosomes. In the years between Hitler's rise to power and the beginning of World War II, hundreds of thousands of Germans hospitalized with various genetic and mental ailments, others afflicted with alcoholism and the like, and still others with no particular problem but who were attracted to people of the same sex, were sterilized without their knowledge or acquiescence but with the agreement of their doctors.

The first wave of American eugenics was bad science, and it caused a lot of suffering before it ran its course, but at least it was stopped short of completely overriding the American notion that acquiring citizenship was a matter of laws and not genes. The European eugenics movements of that period were not inhibited by such laws; in many countries eugenicists were given strength and legal standing by laws that inextricably linked full citizenship to notions of race and “blood.” This coincidence of political and eugenic agendas helped eugenics in Germany to go off the tracks, derailed by an explosive combination of two mistakes.

The first was the belief that an ideal human type exists. As a piece of science this makes little sense, flying as it does in the face of the first tenet of natural selection, that the survival of a species over the long term will depend above all on the existence of a maximum of variation from individual to individual. However, the notion took hold, and from it came the German eugenicists' notion of *Ballastexistenzen*, or “lives not worth living.” With the invasion of Poland in 1939, sterilization was succeeded by wartime euthanasia. Many Germans died in hospitals and nursing homes by gas and lethal injection. When they were done, the killing squads were vetted to new jobs in the concentration camps of the East.

The second mistake arose from the notion that versions of genes would identify an individual whose appearance approached a National ideal. In order for a program of controlled reproduction to be effective, ideal human types had to breed true. Appearances are more certain to breed true when they require the inheritance of two copies of the same version of a gene, one from each parent. These are the so-called recessive versions, because inheriting only one copy does not produce the desired appearance; rather, it recedes in the presence of another version of the gene that generates a different appearance. The versions of

genes that show their effect when only one copy is inherited from one parent—dominant versions—cannot produce the surprise-free stability of behavior and appearance needed for a breeding agenda.

When German eugenicists planned to breed for versions of genes producing appearances of tall height, blue eyes, straight blond hair, small ears, and a small nose, they chose appearances requiring recessive versions of many relevant genes from each parent. Each ideal appearance could, at any generation in the future, be overwhelmed by the inheritance of a single unwanted but dominant version of a gene. These might well come from short, dark-eyed, curly-haired, large-eared, long-nosed people, who might well have been around for a thousand years or more, ignoring or even enjoying their differences from these presumptive Ideal appearances. That was enough to ignite the interest of Hitler—and anyone else in power as short and dark as Goebbels was—who had notions of ethnically cleansing Germany of such people in order to build a “master race” of tall, blond, blue-eyed people.

Under Hitler the next step—marshaling the efforts of a nation behind a program of human breeding for recessive appearances—needed only one piece of scientifically meaningless, emotionally charged nonsense to throw the whole enterprise into malignant focus. This was the notion that in addition to all appearances, every Jewish potential parent was inevitably the bearer of an undesirable, alien, dominant version of a gene that would crush the ones Germany needed, the crazy idea that Jewishness was a single version of a single gene. However inarticulately stated by Hitler's propagandists, and however confused it was by residual notions of “blood inheritance,” this was the academically certified eugenic argument for the destruction by bullet, gas, and fire of German and then European Jewry, of Germans and others who had one Jewish grandparent, and especially of about a million Jewish children some of whom, had they lived, would be exactly my own age today.

German scientists and physicians did not have any simple choice in the matter: as employees and officers of the State, they were expected to comply with each set of new rules. Bonhoeffer's father Karl, for example, as director of the famous Berlin University Clinic, the Charité, argued forcefully, but apparently ineffectively, for the exclusion from euthanasia of persons suffering from certain mental disabilities, on the argument that some of these resembled the mental effects of war, and so might not be fully inherited.

And what of today? The pathological application of eugenics in the Third Reich did not vaccinate us against other, similarly pathological, applications of

biology to human affairs. Consider racism, the common use of skin color as a marker of complicated, partly inherited, partly culturally modulated aspects of human individuality, in particular the vastly complex and uniquely human traits of character and intelligence. This habit lives on even though there can be no impersonal, molecular shortcut to discovering a person's abilities.

Indeed, many medical conditions—and most traits we dislike or qualities we admire—are not the products of single versions of single genes, recessive or otherwise. To the extent that they are inherited at all, they are the consequence of the expression of large and unidentified assemblages of genes as well as of a lifetime of unpredictable interactions with other people. Even today, we can hear someone use the simple but scientifically ungrounded phrase “The gene for” a disease, to describe a damaged gene whose normal function is wholly interdependent with the normal functions of the rest of the entire genome, and whose expression depends on the person's entire life experience. A mutation associated with a disease would be “the gene for the disease” only if all the genes of the body, including the one in question, were not mutually responsible for the good health of a person. The false phrase “the gene for . . .” is the ghost of eugenics, still haunting us all each time we hear it, or use it.

Question 2

In a Christmas present to his co-conspirators in 1942, Bonhoeffer:

. . . criticizes six ethical postures that he found wanting in the previous decade of . . . resistance. . . Reason, principle, conscience, duty, absolute freedom, and private duty—these are the ethics of a “noble humanity,” the best people—but they are weapons “that are not sufficient for the present struggle.” What is needed is to “venture a free action” . . .

There is no doubt what that “free action” was to be, and it was to end in his death by hanging a little more than two years later, on April 9, 1945, sixty years ago and one month before the final collapse and surrender of that evil regime. The moment Dietrich Bonhoeffer decided to enter that conspiracy was a fateful one for him, and a warning for us. We all must work to prevent such a “Bonhoeffer Moment” from ever presenting itself to any of us. The work is simple: to avoid turning away from the facts we see. We must then each try harder to hear the truth about those facts within ourselves, and when we can, to decide to acknowledge that truth aloud, while there is still time and freedom to do so.

We must therefore part company from Bonhoeffer and his co-conspirators to ask our second question, which might be re-framed this way: we are left today with all the ethical gifts Bonhoeffer found wanting by 1942—reason, principle, conscience, duty, absolute freedom, and private duty. Beyond the individual task of finding the courage within ourselves that Bonhoeffer showed us does exist within at least some people, what can we do institutionally, as people of faith but also as worldly people who hope to continue to have had a hand in the building of this society, and the healing of this world? How may we all use these to assure that the era of DNA-based genetic medicine does not turn into a nightmare from which there is no escape except by “free action?”

In the 1970s I was a molecular biologist trying to understand how a normal cell becomes the parent of a cancer, and I had no particular reason to worry about matters like these. Then, I found myself in a situation that altogether changed my way of seeing science as a calling and as a profession. One of the first recombinant DNA molecules contained genes from a tumor-causing virus called SV40 inside the chromosome of the bacterium *E. coli*. Paul Berg’s laboratory at Stanford was on the verge of accomplishing this feat in 1971, and it was to contribute to his Nobel Prize a decade later. It seemed to me then that to put SV40 genes inside a laboratory culture of one of the bacterial species that colonize our intestines, risked accidentally transforming someone’s colon cells by the genes of SV40.

This would be a new route for these genes, one our bodies were not prepared to defend against. Concerned, I called Professor Berg and asked him whether he had thought about the possibility of these risks. His first reaction was one of controlled astonishment at my sheer effrontery, but he did listen. After a few more phone conversations, he agreed to suspend further experiments, and to recommend that others do the same, until the recombinant DNA could be tested for safety.

After several years of testing the results were clear: the many recombinant plasmids, viruses, and bacteria tested were each no more—and sometimes were less—infectious than the most infectious of their original sequences. More to the point of my initial concern, the intestines of volunteers who ingested laboratory strains of recombinant *E. coli* did not, in fact, become overgrown with these bacteria; the normal bacteria of the gut prevailed. Once the test results were in, the National Institutes of Health decided to allow recombinant DNA research to go forward, but it established a Recombinant DNA Advisory Committee to serve as a watchdog and clearinghouse for new developments.

My actions then were clearly fateful, and in an irony that I can neither escape nor fully understand, they have given me a far greater reputation as a scientist, than all but a few of my own research papers. But from the time I called Paul Berg to the present day, I have never been able to feel entirely comfortable with one of the basic premises of science as it is currently practiced. The concept of peer review is built on the notion that scientists alone should judge one another's work, but that phone call to Professor Berg was just too hard for me to make. And though I am sure I had every right to query him as I did, I have often wondered whether I would have called if I had been competing directly with him at the time. I do not know if anyone else has ever made a call like that, but no similar moratorium has ever occurred a second time in the 34 years since then.

Question 3

Go back only a few hundred generations or so, and people—our species—really are one family. Though people tend to aggregate into groups of majority and minority populations—often separated by religion—by the data of our genomes we are all members of genetic minorities that range in size for the millions of a founder population, to the dozens of an immediate family, to the irreducible minority of one which is at the heart and soul of medicine. It would do us well to acknowledge that nothing in the legacy of human DNA blocks the choice to value the differences among us above the resemblance any of us might have to our idea of an ideal person.

Genetic differences among us nevertheless do account for many differences between one person and another. From any one person to another, unrelated one, the chances are that there will be more than one difference in any gene studied, as unrelated genomes differ by as much as one letter in a thousand. We cannot imagine a text with that many variations from copy to copy having in any sense one canonical version. Similarly there can be no biological data to support the racist notion of oneself as a member of a genetically privileged group.

Despite these DNA differences, the six billion different human genomes are all in principle capable of coming together with each other through sperm and egg to make another generation of people. The biology of us makes us truly all equal. More to the point, the history of our species' DNA tells us that we are all the descendants of Africans. The evidence for this comes from many quarters, but DNA evidence is most interesting: because Africa is the first home of us all, people who are the least dispersed descendants of the original people—today's

Africans—have the greatest genetic diversity of all human subpopulations.

The rest of us are, in a sense, tribal offshoots, each the product of a migration that carrying away only a fraction of the genetic richness of our species, which still remains where it began, in Africa. The irony of universal African patrimony only makes the core American racism more stupid, though not less dangerous, than any other dehumanization: only some of us are African-Americans, but all of us are American-Africans.

In our country today, racism has always been, and remains, an all-too-common behavior, and the choice to steer clear of it, is a good example of the sort of Act that makes one a full human being. The Natural Evil of Katrina forced us all to see the consequences of decades of earlier failures to act out of loving kindness. The failure to properly evacuate and care for the beleaguered citizens of the Gulf coast was only lastly a failure of government efficiency. It was initially the predictable outcome of decades of persistent racism, the intentional dehumanization of the population of that area whose ancestors had come from Africa most recently as slaves, at the hands of others whose African ancestors had first stopped over in Europe some tens of thousands of years earlier.

Our country's courts have a phrase over their doors that precisely captures our freedom to choose to do good within the biological realities of Natural Design: "Equal Justice Under Law." Lately, and only after a shocking stretch of total paralysis while New Orleans drowned, we are promised a return to Big government, a veritable New Deal, to repair and reconstitute this area of our country. How will we be certain that we do not at the same time choose to reconstitute these biologically bankrupt racial presumptions?

The latest news is not auspicious. Writing this talk while at my schoolhouse in Vermont a few days ago, I turned to my local newspaper—the *Barre-Montpelier Times Argus*—for the following single headline:

Bush: Whatever it takes

New taxes ruled out for Gulf Coast rebuilding

The poor elsewhere now are slated to lose the government benefits they have depended upon, benefit programs that now must necessarily be cut to pay for the recovery. The rich are now slated to keep their most recent tax cuts. None of us with any means at all will be asked to help the government in its charitable work by the payment of any extra taxes dedicated to the task. The recent dramatic rise in petroleum product prices will not be converted to a tax on excess

profits, to pay for any of this. This is not Equal justice Under Law, it is Natural Design unmodulated by kindness of any sort. It is the governmental equivalent of Nature Red in Tooth and Claw.

We can be sure that such reversion to Natural Design will always consign innocent people to suffering, whenever we do not use our capacity to choose to act with loving kindness. From the *New York Times*, March 5, 2005:

As HIV, the AIDS virus, spreads further, Africa will face “an unprecedented crisis and a challenge never before seen since the advent of slavery,” Dr. Peter Piot, the executive director of the Geneva-based United Nations AIDS program, said at a news conference in Addis Ababa, according to Reuters.

The United Nations said the report was intended to improve decision-making and deepen public understanding of the possible course of the AIDS epidemic in Africa by 2025, when “no one under the age of 50 in Africa will be able to remember a world without AIDS.” By then, 89 million more people in Africa could be infected with HIV, under the worst circumstances, the United Nations said. An estimated 25.4 million people in Africa are infected now. “The death toll will continue to rise, no matter what is done,” the United Nations report said. “There is no single policy prescription that will change the outcome of the epidemic.” . . . [The UN doctors’ report] envisioned investments in health systems, agriculture, education, electrification, water and roads to change fundamentally the ways donors provide aid and recipient countries deal with the donations, to avoid inflation and not promote dependency. Such a situation would provide anti-retroviral drugs to 70 percent of people needing them by 2025.

That effort would be expected to halve the number of people living with HIV and AIDS despite an anticipated growth in population of 50 percent. The cost would be \$200 billion, with the United States increasing its contribution to \$10 billion a year by 2014 and sustaining that amount until 2025, when it would begin to decrease.

The United States could make its payments without noticing the impact to its economy. Why then is this not happening? We face today a local, national, international, and global failure to extend to strangers the minimum amount of respect and love that is the only fully human relationship between any two

people. Our current behavior remains rooted in a national, of not global, refusal to accept that aspect of Natural Design that has made all people alive on Earth fellow Africans, in debt to our African ancestors and obliged to care for their suffering children there today.

In his 1987 novel *A child in time*, Ian McEwan says of a senior civil servant,

The art of bad government was to sever the line between public policy and intimate feeling, the instinct for what is right.

At a time when the line seems quite completely severed in our country if not the world, we must try to understand, and teach how to correct, this scandal of neglect and denial that embarrasses our sciences and trivializes our faiths.

At the Columbia Center for the Study of Science and Religion we have been pleased to find that when we have taught the facts of science to clergy, we have witnessed a transformation: understanding of the data of science enables clergy to put to rest common fears of the process of modern science. We frequently observe that as fears of the natural world dissipate among clergy, an emboldened embrace of science may emerge with an enabled faith. An understanding of the facts of the natural world may, as well, give rise to a more complex and more deeply rooted sense of our religious duty to do justice.

In our current program, we begin at the beginning: we give clergy the information they need to understand the natural world and the challenges it presents to their faiths. This may seem remedial or even trivial, but it is not. Absent that information, clergy responsible for articulating faith and religious action will do so in ways that risk the dangers of guessing the works of nature rather than knowing them. Such guesses make for bad medicine, bad social policy and, we believe, inadequate religion, as well.

We hope to build upon this initial success to create a permanent program to provide clergy with powerful tools to keep alive embodied religious and scientific obligations to preserve a just and functional natural order. You are all welcome to join us.