CHAPTER ONE

Science

THE BEGINNING

What am I? Where do I come from? Where do I fit in? These are questions that humans universally ask, and it wouldn't surprise me to learn that they were asked by *Homo erectus* as well.[1]

The answers to these questions come from the fundamentally human domain of kinship. Of course, all creatures have kinship in a narrow, biological sense: sires, dams, maternal half siblings, and the like. Primates "know" their mothers, and often their mother's elder offspring (half siblings), and even their mother's half siblings (aunts). But that is a narrow sense of the term "kinship." Unlike "kinship" in primatology, "kinship" in humans incorporates paternal relations, residence patterns, reciprocal sets of expectations and obligations, the legal status of marriage, the arbitrary division of the social universe into relatives and non-relatives (when of course we are really *all* related), and the transcendence of individual lives and deaths through the "extrasomatic" quality of the lineage. Relatedness extends

beyond the limits of your birth and death. The fact that different peoples make simultaneous sense of cultural and biological information by weaving it into a coherent framework for understanding everyone's natural place in the order of things was one of the earliest discoveries of anthropology, as well as its oldest research program: kinship. Kinship comprises the intellectual and social rules for making sense of your own place in relation to everyone and everything else. In short, kinship is orienting. It defines the slots into which people are born and become social, symbolizing beings.[2]

Yet no system of kinship is entirely natural; that is to say, none encodes the interpersonal relations established by geneticists. Our familiar American system gives the same term to the brother that your mom grew up with, and to the bozo who happened to marry your dad's sister. One "uncle" is a relative "by blood" ; another, by legal convention. Of your eight great-grandparents, only one carries your mitochondrial DNA, and thus represents your "matriline"—as the modern marketers of mtDNA ancestry tests call it (your mother's mother's mother). Yet in the contemporary United States, only geneticists acknowledge that particular relationship to one of your eight great-grandparents as in any way special.

Decades ago, the earliest anthropologists were astonished at the multiplicity of ways that diverse groups of people thought about relatedness. A child might belong to its mother's family or its father's family or both; some roles of a father might be taken over by an uncle; a child might have several fathers; or might not differentiate between siblings and cousins. Or they might differentiate critically between some cousins and other cousins, or between relatives on either side of the family.

However esoteric or bizarre a kinship system might seem, it nevertheless successfully creates an intellectual framework within

which you have a good opportunity to survive, cope, cooperate, and breed. More than that, it tells you who you are: daughter of so-and-so, father of so-and-so, descended from a line of so-and-sos, and related to other so-and-sos in certain ways. It answers the existential dilemma, Why continue? Because of the network of obligations and expectations into which you were born, and which you've maintained over the course of your life. You are a part of the past, of the future, and a part of those around you. That is who you are, that is where you came from, and that is your reason for existing—your ancestors, your descendants, and your kin.

That said, however, there aren't too many cultures that believe that they are descended from monkeys or apes. There's sort of one—if we consider post-Darwinian scientific culture to constitute a single, historical, analytic unit. We are significantly related to other species.

But of course, there are many ways to conceptualize a relationship between yourself and other species, aside from a genealogical one. In Transylvania, people change into bats and wolves all the time,[3] but that's not Darwinism. In Chicago, people have special relationships with Bears and Bulls; in St. Louis with Rams and Cardinals, but that's not Darwinism either. Darwinism is about a particular kind of relationship with the animals—a relationship of lineal descent.

But then, there's lineal descent and there's lineal descent. Descent is an aspect of kinship, and it's very meaningful. Very few aspects of language translate well cross-culturally, but if you want to insult someone pretty much anywhere, calling them a "bastard" will usually serve the purpose. After all, it is a direct attack on their descent, implying illegitimacy, the lack of a proper place in the social universe.

Descent is important; indeed it is the bedrock of our most sacred institutions, notably of hereditary aristocracy. Why is Pharaoh on a throne, and not you? Because he has better ancestors. However distinguished you may consider your progenitors, they weren't as good as Isis and Osiris. And that's why you're not the Pharaoh.

The point is that descent is important, some people have better ancestors than others, and raising questions about ancestry is politically relevant. After all, if you want to argue that your ancestors are as good as Pharaoh's, and challenge his right to be there, then you are not only opposing the religious orthodoxy; you are also preaching political revolution. Why are you a peasant? Because your ancestors were peasants. Why are you a slave? Because your ancestors were slaves.

Descent is political. So is religion. In 1776, Thomas Paine publishes *Common Sense,* with the goal of articulating the arguments in favor of democracy and against monarchy. But for thousands of years monarchies had been blessed by the spiritual forces of the universe. From China to Peru, imperial leaders were also religious leaders. In 800 AD, Charlemagne's empire would not be just another Roman Empire, it would be blessed as the *Holy* Roman Empire. And now, in the late 1700s, kings claim to rule by "divine right." And so, a couple of decades after attacking monarchies in *Common Sense,* Tom Paine attacks the religion justifying those monarchies in *The Age of Reason.* He has to; if someone tells you that God likes monarchy, and you don't, then you are obliged either to challenge his knowledge of God, or to acknowledge thinking un-Godly thoughts yourself.

Flash forward a few decades, to 1853. There is political turmoil in Europe. Monarchical institutions are gradually giving way to democratic ones; an increasingly upwardly mobile bourgeoisie is

competing with the ancient hereditary aristocracy. An obscure aristocrat named Arthur de Gobineau—calling himself a count, like Monte Cristo and Dracula—writes a defense of the hereditary aristocracy.[4] Why do we need the nobility? Gobineau answers: because they are responsible for civilization. Gobineau thus unites descent with civilization: that is to say, you are civilized because you are from civilized stock, or uncivilized because you come from uncivilized stock. The ruling classes may often seem like lazy, decadent, effete twits, but actually they are responsible for all ten global civilizations (that Gobineau identified), and are also conveniently physically distinguished as "Aryan." Faced with the challenge of finding "Aryans" all over the world, Gobineau imaginatively obliges, explaining that Aryan blood brings civilization, which then declines as the Aryan blood is mixed with that of the locals.

Civilization is thus (in modern vocabulary) in the genes; and it is for this reason that Gobineau is widely known as the father of scientific racism, an epithet obviously not wielded as a compliment. The important thing is to recognize Gobineau's argument as a cry for social stability. It's not about the past so much as it is about the future: the world cannot function without its Gobineaus. They are necessary for civilization; and to supplant them, or to threaten their privileged position (which, of course, they have earned, as the bringers of civilization), would be to jeopardize civilization itself.[5]

Contemporary social philosophers offered little in the way of explicit alternatives. Actually, the term "civilization" had been in use for barely a century, and generally referred to a state of near modernity that was universally attainable, often via missionary work. Civilization was the act of being or becoming civilized, not an organic attribute like a mole or a blood type.

Gobineau's ideas were understandably not widely noted among mainstream social philosophers. Initially promoted by proslavery polygenists in America, such as Alabama's Josiah Nott (who believed that whites and blacks were created separately from one another by God, and thus were of different flesh, for they shared no common descent at all), Gobineau's (creationist) arguments for geneticizing civilization would be repackaged a few decades later by the (evolutionary) conservationist and eugenicist Madison Grant.

Descent and ideology—political, religious, whatever—are all intertwined as part of that historical, social, superorganic miasma we call "culture." They always have been. The mistake is to think that somehow today we can tweak one aspect of culture without affecting another aspect.

SCIENCE AND GENETICS

Science, however, stands outside of culture, as an objective means of finding truth.

Just kidding.

Of course science doesn't stand outside of culture. It's carried out by people who are cultural actors themselves. It has languages and codes of behavior. It's full of political, economic, ideological, and personal conflicts of interest. It radiates with cultural authority, however, which is why all kinds of people and ideas that have no business being called science or scientific often claim to be so anyway.

If we regard science as a "culture," as C.P. Snow famously suggested some decades ago, then scientists are natives, the ones carrying out the scientific activities. By direct implication it

takes anthropology to understand what they are doing. Hence, the "anthropology of science."[6]

The study of how scientific knowledge is produced is one of the most relevant and challenging endeavors of contemporary anthropology. How does science manage to progress, and successfully appeal to value neutrality and objectivity, in spite of the diverse interests of its practitioners? Certainly in the area of biomedicine, financial conflicts of interest are so rife that it is hard to know what claims are credible, even in the peer-reviewed literature.[7] Weapons research is driven by nationalistic political concerns, and much of it is classified information; so how can we look to that as a model of science either?

The scientific study of heredity in particular, however, has the most subtle and insidious conflict of interest, for it lays claim to the voice of scientific authority in matters of descent, that most precious element of symbolic human capital. If we take the discovery of Mendelian genetics in 1900 as the maturation of the field, we can have a look at the very first textbook of Mendelism, called *Mendelism,* and published in 1905 by Reginald C. Punnett, and we will note a very curious punch line. Here is that book's last sentence:

> Permanent progress is a question of breeding rather than of pedagogics; as our knowledge of heredity clears, and the mists of superstition are dispelled, there grows upon us with ever-increasing and relentless force the conviction that the creature is not made but born.[8]

That is not so much a statement of fact as a statement of faith. The study of genetics doesn't tell us that the creature is born, not made. It tells us *how* the creature is made; that is to say, it

studies the transmission of biological features. But it certainly doesn't tell us that the biological features are the most important ones, which is obviously a highly self-interested statement for a geneticist to make.

The idea "that the creature is not made but born" is not what the field of genetics is about at all. It's a highly ideological assumption about the human condition, and frankly, if that's what genetics is about, then it is a faith-based initiative, like creationism, and probably shouldn't be taught in schools. Genetics is the study of the intergenerational biological transmission of features. As such, it is no more important than ecology or anatomy or any of a host of other naturalistic disciplines; and its subject matter is not really the guiding beacon of your life.

To understand the political issues at stake here, we have to go back to the origins of large-scale social inequality, which has arisen over the last 10,000 years or so, as humans began settling down and acquiring possessions, which it didn't make much sense to acquire before settling down, since it would just be more stuff to pack up and take when they moved on. With sedentism comes possessions, with possessions comes wealth, and with wealth comes inequality. Which brings us back to the question we asked earlier: How come you're not the Pharaoh?

Or more broadly: Why are there great disparities in wealth? Why are there haves and have-nots? Why is there inequality?

To which there are two broad categories of answers. The first answer is that the fact of inequality is to be explained by historical injustice, that is to say, by human agency—of the greedy and evil sort. In this scenario, then, we work for social justice to ameliorate the disparities of wealth and power that we see and experience.

The second answer is that there is inequality, to be sure, but that inequality is not an expression of injustice, but rather is a

manifestation of an underlying disparity of innate qualities. This is a modern version of Arthur de Gobineau's answer. People have what they deserve, and if you don't have much, well, tough. You don't deserve it. In this scenario, by contrast, we work to demonstrate the existence of the natural inequality that we have hypothesized to explain the social inequality we observe. And what better way to demonstrate the existence of an invisible fact of nature than scientifically?

Science is relevant in this second answer to a much greater extent than it is in the first answer, where working for justice was the goal. The second answer almost pleads with science to identify and locate that invisible natural hierarchy that rationalizes the social hierarchy. And it would be impolite—nay, downright rude—for science not to try and oblige.

The trick here is to remember that natural science isn't necessarily important to the idea of building a just society. When segregationists argued in 1962 that black children and white children shouldn't be in the same schools because the black race was 200,000 years less evolved than the white race,[9] not only wasn't the relevant science very competent,[10] but it didn't matter. All citizens are entitled to equal rights, *irrespective of their biology or innate abilities.*[11] (Although it would be nice to get the biology and measurements of innate abilities right, too, obviously.) Ironically, decades later, animal rights activists inverted the fallacy, arguing that chimpanzees might be entitled to human rights *because they are so smart*—as if rights ought indeed to be allocated on the basis of a presumptive measurement of innate intellectual ability.[12]

This asymmetry in the role of science in explaining the origins of social inequality—history or biology—is why one rarely hears of positive claims "proving" the same general intelligence or innate abilities of disparate peoples. That side tends to be

reactive against the claims of every generation to have finally "explained" social inequality naturalistically. In one generation it is the size of the head; in another, the shape; or the averaged scores in a standardized test; or the percentage of the "feeble-mindedness allele" in the different gene pools; or the microcephalin allele. The Nobel laureate James Watson probably said it best in 2007, as the *Sunday Times* (London) reported:

> He says that he is "inherently gloomy about the prospect of Africa" because "all our social policies are based on the fact that their intelligence is the same as ours—whereas all the testing says not really", and I know that this "hot potato" is going to be difficult to address. His hope is that everyone is equal, but he counters that "people who have to deal with black employees find this not true." He says that you should not discriminate on the basis of colour, because "there are many people of colour who are very talented, but don't promote them when they haven't succeeded at the lower level." He writes that "there is no firm reason to anticipate that the intellectual capacities of peoples geographically separated in their evolution should prove to have evolved identically. Our wanting to reserve equal powers of reason as some universal heritage of humanity will not be enough to make it so."[13]

The obvious paradox is that the speaker is a molecular geneticist, but he's not talking about molecular genetics. He's just talking about why he thinks the intelligence of Africans isn't the same as "ours." So, as the Brits quickly appreciated, the racist ideas of a Nobel laureate molecular geneticist are no smarter than the racist ideas of a plumber or cab driver. They kept him on the front page of the newspapers for a week, looking increasingly ghoulish, canceled his speaking engagements, and drove him out of the country. A modern society that strives for social justice can't be bothered with the prejudices of foreign scientists.

Any thoughtful person can enumerate all kinds of reasons to think that the general intelligence of large groups of people has evolved to be roughly the same. First, human evolution has been principally the evolution of adaptability, not of adaptation; that is to say, we evolved to be intellectually flexible, not static. Polar bears "evolved" a fur coat; humans "evolved" guns to shoot polar bears and knives to skin them and used their fur coats to keep ourselves warm. And as far we know, pretty much any human can learn those skills. Second, in concert with that understanding of human evolution, immigrant studies show that people can fully adopt any different lifeways in a generation or two. Names change, accents disappear, and economic advancement seems to make everybody look just a bit less alien and threatening. Third, we solve our problems principally technologically these days, and have been doing so for quite a while, and technological change is not a function of intellectual ability, but of social process. Food production didn't begin with a discovery that seeds caused plants, which is known by modern hunter-gatherers; but with the decision to utilize that knowledge in a systematic way. It's not about invention, but about adoption; and that is not a question of genius, but of social action. Fourth, how naive do you have to be to think that you can measure peoples' innate intellectual capabilities independently of their lived experiences? It's hard enough even to conceptualize what the "innate intellectual capacities" supposedly independent of history might even mean. You don't really think that Einstein would have invented calculus, and Newton relativity, if their lives had simply been switched, do you? More to the point, there are simply no facts about modern Africa that can be understood external to the history of slavery and colonialism, and only by recourse to some form of raw, organic brainpower.[14] And fifth, the social

upward mobility that has been achieved in the last half century would have been unthinkable a half century previously; the proper scientific conclusion ought to be that we can expect it to continue, not that it has now met an invisible genetic force field.

I was in Edinburgh at the time of James Watson's British tour, and had a ticket to hear Watson give the Enlightenment Lecture (Watson's invitation was rescinded), and it got me to thinking about another asymmetry in science. Watson was making headlines as a racist scientist—that is to say, as an articulator, even if not necessarily an actual adherent or activist, of now-rejected social and political ideologies. Yet he wasn't booted out of science for those beliefs; he was merely booted out of England. There is a place in science for racists.[15]

Suppose Watson instead had been a creationist. Then he would probably have remained in England, but gotten booted out of science, for articulating a set of now-rejected social and political ideologies. Creationism is an ideology, after all; it is orienting in terms of telling you where you came from and how you fit in, and it is highly political. Its advocates have tried to use the judicial system repeatedly in the last century to give it a leg up on its empirically and theoretically stronger alternatives. And if you are a creationist—that is to say, someone who believes that the human species has a supernatural origin, and is genealogically separated from all other life—then you don't have a future in science.

So one ideology—being a racist—makes you a bit of an embarrassment to other scientists, but allows you to continue to live and work among them. And another ideology—creationism—is just so incompatible with science that "creationist scientist" is a contradiction in terms, an oxymoron in respectable academic circles.

So why isn't "racist scientist" an oxymoron too? Why is it more acceptable to be a racist in science than to be a creationist? The racist believes that because of membership in a particular, ostensibly natural group, some people are inherently less worthy than the members of other, ostensibly natural groups. That view is about as disproved as creationism is, and in equally indirect ways. After all, when a creationist says, "Nobody has ever seen one species change into another," they are right, but not because species don't change. Rather, the timescale makes it impossible for a single person to actually witness it. Consequently, we have to rely on more indirect evidence, which is nevertheless quite compelling to an open-minded skeptic. Like germs, which you can't see, but which apparently can nevertheless still hurt you.

The jury is *not* still out on the issue of whether racial assignment predicts different sets of innate mental capabilities. We—that is to say, anthropologists—looked very hard for a very long time to try and identify such innate racial mental features, and eventually came to realize that it is a fool's errand. More to the point, it is a racist fool's errand. The problems of Africa are social and political, not biological. And anyone who thinks otherwise is being just as anti-scientific as anyone who thinks the universe was zapped into existence 6,000 years ago.

EVOLUTIONISM AND RELATIVISM

The scientific study of our beginnings is founded on two scientific principles: evolution and relativism. Each has multiple meanings, so let us be precise. Evolution here refers to *the naturalistic production of difference,* and its referent is not stars (as in "the evolution of the solar system"), nor human artifacts (as in "the evolution of the airplane"), nor a single body (as in the development or

"evolution" of an embryo into an old fart, as the term was most widely used in Darwin's time[16]). It refers here to groups of organisms, that is to say, biological populations—with some of its processes applying to the differentiation among organisms in the same population, and some applying to differentiation among organisms in different populations. The populations may be parts of the same species, in which case we can talk of microevolution; or of different species, in which case we can talk of macroevolution. Moreover, we can examine the fates of particular lineages themselves, and thus talk of the origins of species and the terminations of species (speciation and extinction, respectively).

Relativism here refers *not* to the nihilistic position that there are no rules; that is to say, that because I read somewhere that the traditional Eskimos and Yanomamos beat their wives, therefore I should be allowed to beat my wife. It rather means something close to the opposite: every society, including yours, has standards of behavior, and what you think the Eskimos or Yanomamos do is irrelevant to what you should be doing.[17] Nevertheless codes of behavior, including yours, are historically produced, and are thus understandable not as being transcendent and immutable, but as situated and fallible. We don't stone witches any more, even if the Bible says we should.[18]

Other codes are also the results of history, of human agency, and social process. Consequently in order to make sense of diverse human behaviors, you cannot understand them as crude imperfect approximations to your own behaviors, but only as the products of different histories. As mundane as this may sound today, it is quite directly analogous to other intellectual shifts that took place in the eighteenth century. In one case—biology—Carl Linnaeus, Swedish botanist/physician, argued that species ought not be judged in relation to how similar they are to humans, but

by how similar they are to one another. He thus undermined the traditional one-dimensional view, which saw species as comprising a "Great Chain of Being" or "Scale of Nature."[19] By establishing the place of a species only in relation to other species, and not in relation to our own species, Linnaeus was relativizing biological systematics. One kind of metaphorical hierarchy—a ranked, linear hierarchy—was being replaced by another, a hierarchy of inclusion, of various sets within sets. Linnaeus's inference about the pattern of nature would sweep through the academy with only minor opposition, although it would be another century before that nested hierarchy—those sets within sets—would be explained as the trail of common ancestry, by Darwin.

About the same time, of course, there were those preaching that all people (or at least, all white men) should have equal rights as citizens under the law, which went counter to the long-held and well-entrenched view that they shouldn't. Maybe a monarchy headed by a king sitting atop a social ladder, against whom all subjects would be differently gauged according to their status at birth, is a worse situation than a republic, in which all citizens might be entitled to things like liberty, equality, and brotherhood. Once again, a linear hierarchy is replaced by a relativizing framework.

European philosophers had been grappling since the mid-1600s with the question of whether civilization represented progress or decadence. Was "the savage" a near animal, living in a state of perpetual war, or was he somehow deserving of our admiration? After all, the most natural human social relationship was not master/servant, but the free and easy equality of primitive peoples.[20]

World War I pretty much ended that debate, as the most technologically advanced peoples showed themselves to be

simultaneously the most barbaric peoples. Death from a lion or cobra in the jungle didn't seem quite as bad any more, when compared to a horrible death from poison gas on the front, or the terror of aerial bombardment.[21] So if civilization could be considered progress only if we considered arbitrary, narrow aspects of it—say, bracketing off technology from all other aspects of civilization—then what good was the concept of progress? There was adaptation—to climate, politics, and economics—but all groups of people adapted, although they did it differently, and in response to different stimuli, like the stimulus of new technologies and social circumstances.

So as long as people were human, they would now be seen as fully cultural beings—not more or less cultural than us, or than anybody—just *differently* cultural. Their cultural similarities and differences were the products of history, and their physical, biological, craniological, or genetic patterns of similarity were correlated variables, but irrelevant to a causal analysis of cultural forms. Just as eighteenth-century biology rendered it decreasingly sensible to measure all animals against *Homo sapiens,* twentieth-century anthropology rendered it decreasingly sensible to measure all cultures against modern urban America. You could compare things, to be sure, but comparisons would be made horizontally, or non-judgmentally, as it were—as one might compare a buffalo to a scorpion. There are enviable and unenviable aspects of each, but they are both good at what they do, which is to survive, adapt, and breed as buffaloes and scorpions.

So too with human cultures, but with one important difference. Since cultures are the products of human thought and activity, a full understanding of them is necessarily experienced, and cannot really be objectified. This horizontal, experiential,

comparative understanding of lifeways, already entrenched in American and British anthropology, was popularized in Ruth Benedict's 1934 book, *Patterns of Culture,* as "cultural relativity."[22] (Albert Einstein had won the 1921 Nobel Prize in part for showing that things as apparently invariant as mass and time could be experienced differently at the speed of light—and of course used the same word. Quite possibly the ideas were independently derived from nineteenth-century German philosophy. But I suspect that the early anthropologists were capitalizing on the publicity of the physics.)

Most importantly, then, it was no longer scientific to see different human lifeways as the products of superior or inferior individual intellects. That would be the equivalent of the natural philosophy of the Bridgewater Treatises in the 1830s and 1840s.[23] Erudite perhaps, but premodern. Our species differentiated by naturalistic process from earlier species—and miracle is no longer considered explanatory here; and we also differentiated by historical process from earlier cultural systems, and genetics is no longer considered explanatory here. Indeed, to look for genetic explanations for social-historical facts is like looking for miracles. It's obsolete, ideologically based, unscientific, and should not be countenanced as science. Worse yet, it gives science a bad name (something that creationists, climate change deniers, and UFOlogists are not able to do), by making science into simply another tool for the maintenance of social inequality.

Science is supposed to be liberatory, not oppressive.

Because of the asymmetry of the role of science in the two claims, the rule of thumb has got to be, Any claim to validate human social inequalities scientifically is probably bogus. Every such claim up to this point has been shown to be so. And that is

indeed a pretty fair encapsulation of the history of physical anthropology.

PHYSICAL ANTHROPOLOGY

It is hard to look at the history of the study of human origins and diversity and not see it as a transformation from a science of oppression to one of liberation. The field began with the study of the correlated diversity in appearance and behaviors. Exotic peoples not only acted exotic, but they looked exotic as well. Their enslavement or destruction or exploitation at the hands of Europeans had its bleeding-heart critics, to be sure, and an axis certainly existed on the question of whether exotic peoples were irredeemably exotic, or just like us but slightly different.[24] Physical anthropology was the science that made the correlated variables into causal variables: people looked different and acted different, because they really were different, and physical anthropology studied the naturalistic aspects of that difference.

It was everywhere politicized early on. In the United States the "American school" of physical anthropology were apologists for slavery, citing the stability of racial features, and often inferring separate origins for the races on that basis (polygenism). The science was mooted by the Civil War, and not really revived until the recruitment of Aleš Hrdlička by the Smithsonian at the turn of the century.[25]

In England, the question of one or separate origins for the human races divided interested scholars into the (monogenist) "Ethnologicals" and the (polygenist) "Anthropologicals," each with their own society and publications. Charles Darwin and Thomas Huxley were "Ethnologicals," and Huxley was the last president of the Ethnological Society of London. Huxley over-

saw the absorption of the rival of the Ethnological Society, which took its rival's name, becoming the Anthropological Institute of Great Britain and Ireland in 1871, and later, the Royal Anthropological Institute.[26]

On the Continent, relations were invariably tense between France and Germany, as Germany became unified and militarized under Otto von Bismarck. In the heat of the Franco-Prussian War, the physical anthropologist Armand de Quatrefages claimed to have demonstrated cranially that Prussians were not even true Europeans at all, but interlopers, related to the Finns. In response, the Germans insisted that "race" and "nation" were not so tightly connected, and began the first systematic anthropometric survey of their population, which began to disentangle the concepts of "race," "nation," and "type."[27] It is an irony of history that the intellectual descendants of those first German anthropologists were the students of Franz Boas in America; while German anthropology itself was eventually hijacked by the naturalizers and synonymizers of race, nation, and type.

So everybody used the science for political ends and denied that they were doing it, for that wouldn't be good. It was always someone else doing it.

Columbia University saw the value in a specialist in the bodies of exotic peoples, and recruited Franz Boas, whose principal research lay in measuring schoolchildren and the indigenous peoples of Canada. A few years later, the Smithsonian hired Aleš Hrdlička, and about a decade later, Harvard hired a classicist/archaeologist named Earnest Hooton. Boas would turn to cultural anthropology, Hrdlička would devote himself to organizing and museum research, and Hooton would become a celebrity academic at Harvard, and train the next generation of physical anthropologists.

Franz Boas and Earnest Hooton had a cautious, but respectful relationship. Boasian anthropology was descended from the first-generation Berlin anthropologists who had begun dissociating the natural from the cultural, and were founding a science of ethnology—the scientific, comparative analysis of human cultures—on the basis of a "psychic unity of mankind."[28] In other words, the wiring of the brain is irrelevant to understanding the basis of human social and cultural differences; it is functionally a constant, and you can't use a constant to explain a variable.

Hrdlička's anthropology, on the other hand, was derived from that of the French craniological school;[29] and Hooton's from the archaeologists at Oxford. Both groups tended to place rather more weight on biological difference as explaining behavioral difference. Hooton, in particular, struggled to differentiate (good) American racial anthropology from (bad) German racial anthropology in the 1930s. But he was unsuccessful, for both were saddled with the same false assumptions about the causal nature of the relationship between biological difference and cultural difference. In 1936, when Boas circulated a petition condemning Nazi race science among the leaders of the physical anthropology, only Hooton and Hrdlička would sign on. Most other physical anthropologists, like Raymond Pearl of Johns Hopkins, respectfully declined.[30]

But Hooton clung to the idea of state-controlled breeding programs well into the 1930s, after most American scientists had begun backing away from it, which was partly in reaction to the enthusiasm with which the Nazis were embracing it. In 1937, Hooton made the *New York Times* with a speech to a group of Harvard alumni in Kansas City, in which he called for the improvement of modern society by encouraging only the fittest

to breed, and for a "biological purge upon the unfit." Two years later, he published his magnum opus, *The American Criminal,* Volume 1, which statistically analyzed the faces and bodies of criminals and contrasted them against the faces and bodies of volunteer firemen in three different states, purporting to demonstrate a corporeal dimension to criminality. It was so poorly reviewed that Harvard University Press never published a second volume.[31]

After World War II, Hooton's students populated the chairs of physical anthropology in the United States, and transformed the discipline. This transformation was spearheaded by Sherwood Washburn's vision of a "new physical anthropology," which would centralize human evolution, incorporate primate studies, and restructure the study of human physical diversity as the study of how human groups adapt and change bioculturally, rather than as a naturalistic pseudoexplanation for human behavior.[32] The Boasians had got it right after all: the greatest component of human diversity is its cultural component. If you analytically—and perhaps perversely—separated out the minor component of human diversity that is biological, rather than cultural, you would find its major feature to be cosmopolitanism, or the same variations appearing in many groups, rather than differences between the groups. As articulated in the 1951 UNESCO Statement on the Nature of Race and Race Differences, "With respect to most, if not all, measurable characters, the differences among individuals belonging to the same race are greater than the differences that occur between the observed averages for two or more races." Moreover, if you ignored the cultural and the biologically cosmopolitan, what now remained of human diversity was principally clinal—that is to say, distributed in geographical gradients. And what was

left without the cultural, the cosmopolitan, and the clinal was principally local variation. As the Oxford physical anthropologist Joseph Weiner put it in 1957, we now saw human populations "as constituting a widespread network of more-or-less interrelated, ecologically adapted and functional entities."[33]

If you were interested in human diversity, race was a biological tail wagging a cultural dog. Race was thus defined out of scientific relevance; that is to say, "racial problems" were not really racial at all, they were social problems. Having thus solved the problem of race, physical anthropology was now free to focus on human evolution, microevolution, and primate behavior. Indeed, it began to acknowledge the relevance of data that were "biological," if not quite "physical"—such as behavior and DNA.

SCIENTIFIC ANTHROPOLOGY

What is it that makes the scientific narrative of human origins better than other narratives? Perhaps "better" isn't quite the right word. What makes evolution, or some version of it, a *scientific* narrative, as opposed to creationism (or some version of it)?

Here's the problem. As soon as you establish some criterion for demarcating a scientific from an unscientific practice, it's quite easy to find a science that lacks that property, but is nevertheless still science. Testing hypotheses—Karl Popper's famous criterion—doesn't account for the Human Genome Project, which was purely inductive—we were sequencing the complete human DNA sequence because we could; we knew it was important, and expected that something interesting would fall out of it. Yet nobody doubted that it was science.

What differentiates science is the scientific mind-set, or the "epistemic virtues" you bring to the work.[34] Modern science can

probably be reduced to three such ideas: naturalism, empiricism, and rationalism. Naturalism is the assumption that there is a division between the world of spirit and miracle, and that of matter and law; and that a scholar can effectively bracket off the latter and study it separately. The earliest modern ethnographic fieldwork showed how unusual an idea that is. People don't generally conceptually separate the two realms: the world of magic and caprice interpenetrates that of materiality and predictability.[35] And when you think about it, neither do "we" really separate them fully, except in science. Whether in Las Vegas or Wrigley Field or Wall Street, our hopes, dreams, and prayers intersect with the regularities of matter, motion, randomness, and life all the time. Modern people find ways to accommodate both antibiotics and heavenly invocations for health simultaneously. Our coinage, after all, doesn't say, "In representative government we trust," but rather, "In God we trust"—as if the basic issue were appropriate piety, rather than the politics and struggles that ultimately brought about some measures of democracy and freedom. And every night, a non-trivial percentage of graduate students in the natural sciences goes to sleep hoping (and even praying) for positive experimental results.

The point is that separating the two realms is weird, which is why nobody really attempted it until fairly recently. When they started to do it, in Europe in the early 1600s, they called it by code names, like "the Secret College" and "the New Philosophy." Eventually it came to refer to the most reliable and powerful forms of knowledge, as in Francis Bacon's famous axiom, *scientia potestas est,* generally rendered as "Knowledge is power."[36]

The second assumption science brings is empiricism, that ideas must be matched up to perceived reality, and that the former must be adjusted to be consistent with the latter. Once again

there is a lot to be taken for granted culturally here. After all, evidence is important in many kinds of non-scientific activities. If you are a reader of chicken entrails or tea leaves, you still have to consult them for the specific omens, which requires knowledge of how to translate observations into predictions. If you want to convict a witch or a traitor, you still have to base it on something; yet neither divination nor law is science.

The kinds of things that architects, engineers, and stonemasons traditionally built—from boats to temples to aqueducts—are based on the application of accumulated knowledge, often trial and error. The ancient Greeks respected this, and called it *techne,* the knowledge for building and doing. But they distinguished that from an understanding of how the universe is put together, and how the things in the world actually work, and where they come from—the order in things—which was a different kind of knowledge, *episteme.* We often maintain a semblance of this distinction in "applied" versus "pure" science, but that's not quite it, for the Greek *episteme* incorporated how to think about nature, or what we would consider philosophy today.

By the seventeenth century, European scholars distinguished natural history from natural philosophy, the former referring to the collection of facts about the world, and the latter referring to a systematic understanding of how the world works. Newton's *Principia* (1687), a work of natural philosophy, nevertheless had implications for understanding the facts of moving bodies. Consequently, throughout the eighteenth century these bodies of knowledge became gradually realigned, so that facts, their understanding, and whatever application they might have would now begin to be embodied in a single person, a "scientist"—a word coined in the 1830s.[37] Darwin's *Origin of Species* (1859), a work of natural history, closed the circle, with its implications for

understanding the forces that had produced the facts of life. The point, once again, is that the value of evidence-based comprehensions of the world is not necessarily self-evident. It requires the convergence of several kinds of specialized knowledge. You don't actually need to know about the condensation cycle to know that you need rain for your crops to grow, or to predict when the rains are likely to come.

Finally, we come to the third scientific assumption, a watchword of eighteenth-century scholarship—rationalism, the application of reason to guide the construction of evidence-based explanations. In practice, this means the downgrading of the explanatory power of the miraculous. Over the century that stretched from the Dutch philosopher Baruch (Benedictus) Spinoza in the 1640s to the Scottish David Hume in the 1740s, miracles took a terrible beating within the scholarly community. It wasn't that science was showing that God didn't exist, but that theologically He was being reconceptualized as a motive force in the universe, rather than as a super-father or mega-king.[38] He made the laws by which the universe runs—and those laws forbid the sun from standing still in the sky for a full day, or a star from leading a caravan from somewhere in Iran to a manger in Bethlehem. It was simply much more likely that there was a mistake somewhere—either in the veracity and accuracy of the story or in the understanding of the original witnesses or in the fidelity of the story's transcription since that time. By the 1790s, the history of language was being treated rationally, despite the biblical story of the Tower of Babel. Concurrently, geologists were studying earth history despite the biblical chronology, and a germ theory of disease was gaining popularity in epidemiology as the belief in spirit possession as a cause of illness was on the wane. By the 1830s, even the life of Jesus was being treated

rationally, rather than as a series of miracles.[39] A scientific classic of 1890, James Frazer's *The Golden Bough,* began its analysis of the gospel with the radical assumption that the proper frame of reference for understanding it was in the myths and legends of the ancient Near East.

It is the convergence of these three ideas—naturalism, empiricism, and rationalism—that permits us to define the Human Genome Project into science and creationism out of it. Defining creationism out of science, however, does not solve the problem of creationism, any more than defining ancient alien astronauts out of science can solve that particular problem.