

Culture Exists

Anthropologists, sociologists, and historians express disbelief when told that serious students of human behavior find culture peripheral to their analyses of human behavior. Nevertheless, the truth is that culture plays little role in disciplines like economics and psychology. Scholars working in such traditions usually don't deny that culture is real and important, but maintain that worrying about how it works or why it exists is just not part of their job description.¹ But we suspect that for some in these disciplines, benign neglect is accompanied by a largely unarticulated prejudice against cultural explanations. Confronted with differences in marriage systems, inheritance rules, or economic organization, many scholars prefer economic or ecological explanations, no matter how far-fetched, over those that invoke cultural history.

This view is common (though far from universal) among our colleagues in evolutionary social science. From the beginning, many such scholars have been blunt in their rejection of the idea that culture has any important role in human affairs. As one of the founders of sociobiology, Richard Alexander, puts it, "Cultural novelties do not replicate or spread themselves, even indirectly. They are replicated as a consequence of the behavior of vehicles of gene replication."² In the same vein, psychologist David Buss remarks, "'Culture' is not an autonomous causal process in competi-

tion with 'biology' for explanatory power."³ Or, even more directly, anthropologist Laura Betzig says in reaction to claims for the importance of culture: "I, personally, find culture unnecessary."⁴

The main purpose of this chapter is to convince the skeptics that culture is necessary, and to show that variation in human behavior cannot be understood without accounting for beliefs, values, and other socially acquired determinants of behavior. Those who would deny a role for culture place the entire burden of explaining human diversity on some mix of genetic and environmental variation—but neither genetic nor environmental differences can bear the explanatory weight this approach places on them. The evidence accords better with the traditional views of cultural anthropologists and kindred thinkers in other disciplines: heritable cultural differences are crucial for understanding human behavior.

Cultural differences account for much human variation

The diversity of the human species is striking especially when you think about peoples in other parts of the world. Consider, for example, the Copper Eskimo and the Trobriand Islanders. In the winter, the Copper Eskimo lived in snow houses built on the frozen sea. They obtained food by spearing seals at breathing holes in the ice, sometimes waiting motionlessly for hours in the bitterly cold darkness. In the summer, they lived in skin houses and hunted from cunningly constructed sealskin kayaks. They dwelled in groups of families linked together by a web of reciprocity without chiefs or councils. On the Trobriand Islands, many families shared a large wooden house. They subsisted on yams and taro grown in gardens that had been cleared and cultivated by hours of backbreaking labor in the humid tropical sun. They were ruled by a hereditary aristocracy with an elaborate system of rights and privileges based on membership in large matrilineally organized clans. Now add to the list nomadic pastoralists living in the starkness of central Arabia, the rice farmers of Java with their intricately nuanced social life, and the teeming economic and ethnic complexity of Los Angeles, and you will be convinced of the magnitude of human variation.

Three things could act as *proximate* causes of this variation. First, people may vary because they inherited different genes from their parents. Second, genetically similar individuals may differ because they have lived in different environments.⁵ Finally, people may differ because they have acquired different beliefs, values, and skills through teaching and observational learn-

ing. Because the three sources of variation interact so richly in determining our behavior, people sometimes lose track of the important differences.⁶ Consider the causes of variation in body weight, a character of concern to many of us. Clearly, environment can have a powerful effect on body weight. Central Europeans were undoubtedly leaner on average in 1918 and 1945 than they are today. Culture can powerfully affect body weight through work habits, ideas about appropriate diet, recreational preferences, innovations in the restaurant industry, and ideas about what constitutes physical beauty. In one West African culture, young girls are secluded for months and force-fed large meals several times a day for the express purpose of making them become extremely fat. In the United States, young girls (among others) avoid desserts and do aerobics to achieve a very different culturally transmitted ideal. At the same time, cheap, calorie-dense foods are heavily promoted by a highly competitive fast food industry. Caught between the gym and the supersized extra value meal, variation in the weight of Americans is enormous. Recent research has also shown that some genetic constitutions are predisposed to be heavier than others even with similar diets.

The “common garden experiment”

So, which is more important in determining people’s behavior: genes, environment, or culture? You can calibrate your own position on this question by considering the following thought experiment. Choose two groups of people who live in different environments and behave differently—say, Eskimos and Trobriand Islanders. Next, suppose a population of Eskimos moves to an empty island in Melanesia and a population from the Trobriands moves to the high Arctic. Then, allow enough time for the *individuals* in each group to learn as much as they can about how to best behave in their new environment. Now here’s the test: Do you think that the political system, religious practice, or kinship system of the Trobriands living in the Arctic will resemble their Eskimo neighbors more than their Trobriand ancestors? If so, then you are one of those who minimize the importance of culture. Or, will the political system, religious practice, or kinship system of the Trobriands living in the Arctic resemble that of their Trobriand ancestors more closely than their neighbors, the Eskimo? If that is your position, you think that the natural environment was not the source of the original variation in these characters—there must be something else that is transmitted through time. It could be culture, but it also could be genes or a self-replicating social environment.

Much better than a thought experiment would be a real experiment. While such an experiment would be unethical and impractical, its essential elements have been played out in various ways as people with different cultural histories have come to live in the same environment, and as culturally similar people have been challenged by divergent environmental changes. We submit that the following examples provide as strong evidence that some transmitted factor—culture, genes, or transmitted environment—plays an important role in shaping human societies. Then we will present evidence that neither genes nor transmissible environment is likely to be sufficient to explain the variation between human societies, leaving culture as the most likely suspect.

Illinois farmers from different immigrant backgrounds behave differently

The Midwest region of the United States was settled in the nineteenth century by immigrants from many different parts of Europe who brought with them the language, values, and customs of their native lands. Today, most overt traces of ethnic origin are gone—you cannot guess people's origin from their language or dress. But their farming practices are still substantially different. Rural sociologist Sonya Salamon and her colleagues have studied the effect of ethnic background on midwestern farmers, and found that people from different ethnic backgrounds have quite dissimilar beliefs about farming and family, and make very different decisions about farm management even though they have similar farms on nearly identical soils only a few miles apart.

One of Salamon's studies focused on two farming communities in southern Illinois, Freiburg (a pseudonym), inhabited by the descendants of German-Catholic immigrants who arrived during the 1840s, and Libertyville (also a pseudonym), settled in 1870 by people from other parts of the United States, mainly Kentucky, Ohio, and Indiana. These two communities are only about twenty miles apart, but the people in Freiburg and Libertyville have different values about family, property, and farm practice which are consistent with their ethnic origins. The German American farmers of Freiburg tend to value farming as a way of life, and they want at least one of their sons or daughters to carry on as farmers. According to one of Salamon's informants,

The money's immaterial. I want a comfortable living for myself, the main thing is that it's something I've put together and I want to see it stay together. . . . I'd like to come back in 500 years and see if my great-great grandchildren still have it.⁷

These kinds of attitudes make the people of Freiburg very reluctant to sell land. Their wills specify that their farm will go to a child who will work the land and use farm proceeds to buy out any nonfarming siblings. Parents put considerable pressure on children to become farmers, but place relatively little importance on education. Salamon argues that these “yeoman” values are similar to those observed among peasant farmers in Europe and elsewhere. In contrast, the “Yankee” farmers of Libertyville regard their farms as profit-making businesses. They buy or rent land depending on economic conditions, and if the price is right, they sell. After a farmer sold out a good price, his neighbor commented approvingly, “[Y]ou don’t make that money selling beans.” Many farmers in Libertyville would like it if their children were to continue farming, but they see it as an individual decision. Some families help their children enter farming, but many do not, and they generally place a strong value on education.

The difference in values between Freiburg and Libertyville leads to different farming practices despite the nearness of the two towns and the similarity of their soils. Farms in Libertyville are about five hundred acres, nearly twice as large as those in Freiburg, because the Yankee farmers rent more land. Freiburg farmers are conservative, mainly farming the land they own, while Yankee farmers aggressively expand their operations by renting. The two communities also show striking differences in what they grow. In Libertyville as in most of southern Illinois, farmers specialize in grain production—it is the primary source of income for 77% of the farmers there. In Freiburg, farmers mix grain production with dairying or livestock raising, activities that are almost absent in Libertyville. Because these activities are labor intensive, they allow the German American farmers to accommodate larger families on more-limited acreage, consistent with the German farming goals. Yankee farmers don’t go in for dairying and stock raising because “we could make more money from the land without all that work.”⁸

The differing values of German American and Yankee farmers lead to differing patterns of land ownership in the two communities. In Freiburg, land rarely comes up for sale, and when it does, the price is higher than in neighboring areas. Salamon argues that the farmers there are willing to pay more for land because they are not solely maximizing profit—they want to provide land for their children. As a result, land is virtually never sold to non-Germans. In 1899, 90% of the land in Freiburg was owned by people of German ancestry, and by 1982 that figure rose to 97%. In Libertyville, land comes up for sale more often and at a lower price. The proportion of land owned by Yankee farmers has fluctuated considerably over the last

one hundred years. Moreover, absentee landownership is more common in Libertyville—locals own 56% of the land in Libertyville, compared with 78% in Freiburg.

Similar patterns of ethnic variation exist elsewhere in Illinois. Salamon and her coworkers spent five years studying five ethnically distinct communities in east-central Illinois—German, Irish, Swedish, Yankee, and mixed German-Yankee.⁹ As in the previous study, the five communities are near one another and have very similar soils. Their residents have many different beliefs and values, some of which are reflected in farming practices and patterns of land ownership. For example, the German and Yankee communities exhibit some of the same patterns of belief and behavior as in the southern Illinois study. Other groups, like the Irish and Swedes, differ in other ways.

The Nuer conquest of Dinka lands did not cause the Nuer to become like the Dinka

During the nineteenth and early twentieth centuries, two groups of people lived in the vast marshes of southern Sudan, the Nuer and the Dinka. Both groups lived a migratory existence, settling in villages and growing millet and maize in the wet season and then spreading out to graze their cattle on pastures uncovered by the subsiding flood in the dry season. The Nuer and the Dinka both numbered more than 100,000 people, and each was subdivided into many politically and militarily independent tribes numbering between three thousand and ten thousand people. Anthropologist Raymond Kelly provides a detailed account of the complex relationship between the Nuer and the Dinka over a period of half a century.¹⁰ In about 1820, one of the Nuer tribes, the Jikany Nuer, migrated roughly three hundred kilometers to the east of their homeland, eventually invading land occupied by two Dinka tribes. Over the next sixty years, the Nuer expansion continued as tribes expanded south and west, conquering Dinka tribes and increasing their territory from a small area to more than half the swampland of the southern Sudan. Kelly estimates that more than 180,000 people, mostly Dinka, lived in the area conquered by the Nuer, and many were incorporated into Nuer society. There is every reason to believe that the Dinka eventually would have been eliminated had not the British intervened to suppress the conflict in the early 1900s.

Although they lived in the same environment, used the same technology, and were derived from the same common ancestors perhaps a thousand years ago, the Nuer and the Dinka differed in important ways. The

Nuer maintained larger herds, with about two cows for each bull, while the Dinka kept smaller herds, with about nine cows per bull. The Nuer rarely slaughtered cattle, subsisting mainly on milk, maize, and millet. In contrast, the Dinka frequently slaughtered and ate their cattle. As a result, Nuer population densities were about two-thirds those of the Dinka. The smaller human populations and larger cattle populations of the Nuer led to a number of differences between their yearly subsistence round and that of the Dinka. Most important, the dry-season settlements of the Nuer were much larger than those of the Dinka.

Another difference between the two peoples lay in their political systems. Among the Dinka, a tribe was the group of people who lived together in a wet-season encampment. In contrast, membership in Nuer tribes was based on kinship through the male line. As a result, the growth of Dinka tribes was constrained by geography, while Nuer tribes could in theory grow indefinitely. In fact, Nuer tribes seem to have been about three to four times larger than Dinka tribes. Kelly estimates that at the beginning of the expansion period, Nuer tribes averaged about ten thousand people, while Dinka tribes averaged only about three thousand.

Kelly argues that the differences in subsistence practices and political organization stemmed from the differences in “bride-price” customs. Among both the Nuer and the Dinka, the families of the bride and groom exchanged livestock at the time of a wedding. Custom specified the number of cows and goats that various classes of kin were expected to give and receive. Among both the Nuer and the Dinka, there was a net transfer of livestock from the groom’s family to the bride’s family, what anthropologists classify as bride price (rather than dowry). The details of such payments differed substantially between the Nuer and the Dinka. For the Nuer the minimum payment was about twenty head of cattle (the exact number varied); credit was not accepted. There was also an ideal payment of about thirty-six head. Between the minimum and the ideal payments, the groom’s family had to pay all that it could, keeping only enough for subsistence. In contrast, the Dinka had no minimum payment and readily allowed credit. This meant that when times were tough, as during the rinderpest epidemic of the 1880s, Dinka weddings proceeded even though the bride’s family might not receive any cows for an entire generation. The ideal and the minimum payments were substantially lower among the Dinka than among the Nuer, and Dinka payments often included goats. Kelly maintains that the Nuer kept larger herds to accommodate their larger and more inflexible bride wealth payments.

The distribution of livestock also varied. The Dinka gave livestock to the groom's paternal and maternal relatives, while the Nuer restricted bride-price payments to the groom's paternal relatives. This caused alliances to form among patrilateral kin in the Nuer and more-diffuse alliances to be established among the Dinka. Patrilateral alliances, in turn, caused the Nuer to develop a political system based on patrilineal clans, while the Dinka evolved one based on coresidence.

Distinctions between the Nuer and Dinka cannot be attributed solely to the environment. Both tribes lived in very similar habitats—seasonally flooded swamps. Of course, there are small environmental differences between the original Nuer homeland and the areas originally occupied by the Dinka, and people committed to strict environmental determination have argued that these are responsible for the behavioral differences between the two peoples. For example, anthropologist Maurice Glickman argued that the drier Nuer homeland allowed larger encampments during both the wet and dry seasons, giving rise to the other differences between the two groups.¹¹ But arguments of this kind all fail because the expansionist Nuer came to occupy exactly same environment as the departed and conquered Dinka. If environment determines culture, then the invading Nuer should have become like the Dinka, but the Nuer have continued to act like Nuer even after 100 years on former Dinka lands. Rather, tens of thousands of Dinka who remained in the conquered territories adopted the Nuer customs.

The social and economic variations between the Nuer and the Dinka had important consequences. Nuer military superiority allowed them to expand at the expense of the Dinka and was closely linked to other elements of their culture. Among both the Nuer and the Dinka, tribes were the units which conducted warfare. The Nuer did not conquer the Dinka; rather, various Nuer tribes conquered certain Dinka tribes. No Dinka tribe ever conquered a Nuer tribe, despite the fact that the military technology and tactics of the two groups were very similar. Nuer victories were routine because their tribes were larger. Nuer armies of fifteen hundred men easily defeated Dinka armies numbering about six hundred. The Nuer were able to recruit larger armies because their tribes were larger and because warfare typically occurred during the dry season, when Nuer encampments were larger. Notice that the Dinka did not adopt Nuer practices before they were conquered and assimilated, nor did they develop innovative military institutions to check the Nuer expansion. In chapter 6 we will consider some reasons we observe such cultural inertia.

A comparison of four East African groups shows cultural variation is important

Anthropologist Robert Edgerton conducted a landmark study to investigate what happens when culturally similar peoples occupy quite different environments.¹² He focused on four East African tribes, the Sebei, Pokot, Kamba, and Hehe. Some communities of each of these tribes live in moist highlands, where they rely mainly on farming, while other communities of each group live in dry lowlands, where herding is more important. In each case, the highland and lowland groups had been in place for several generations, but there had been some contact between them over time.

Edgerton measured attitudes in each of these communities using a battery of psychological tests. For example, he asked people to respond to drawings which included scenes like a father confronting a misbehaving and disrespectful son, cattle damaging a maize farmer's field, and armed warriors raiding cattle protected by children. Respondents were asked to explain what was happening in the picture and what ought to happen in the scenes, as if they were taking place in the local village. Edgerton scored individual responses according to whether or not they included references to conflict avoidance, respect for authority, valuation of cattle, and self-control. Other measures involved more-structured questionnaires.

If culture played little role in shaping human behavior, the attitudes Edgerton measured should be associated with subsistence, not tribe. Migratory herding of cattle demands a much more fluid social organization than farming.¹³ Farmers and herders should have different attitudes, but farmers from different tribes should be similar to each other, and so should herders. If culture is important, then tribe may be more important than subsistence. In this case, Kamba farmers and Kamba herders would be more similar than Kamba farmers and Sebei farmers or Kamba herders and Pokot herders.

Edgerton's results show the importance of culture. As he summarizes, "We . . . conclude that there can be no doubt that if we wished to know how someone in these four tribes would respond to the interview administered in this research, we would best predict that person's responses by knowing the tribe to which he belonged."¹⁴ In a few cases, Edgerton did find evidence that ecological differences outweigh cultural ones: pastoralists, regardless of their tribal affiliation, have much more respect for authority than do farmers, which may result from the control over cattle maintained by senior men. However, an attempt to replicate this finding in southern

Tanzania by anthropologist Richard McElreath was only partly successful. McElreath found the same farmer/herder contrast in respect for authority among the Sangu, who, in different areas, pursue both subsistence systems. But among the Sukuma, a group of highly successful pastoralists, respect for authority is very low.¹⁵ Instead, the Sukuma have a traditional system of collective social control and dispute resolution that commands great respect. This system requires that the leaders of the collective system be subject to sharp criticism for even minor infractions of rules.¹⁶ Certainly, the cultural diversity of people living in the same environment should never be underestimated!¹⁷

There are many similar cases

Many other examples tell the same story: people having different cultural and institutional histories behave differently in the same environment. Here are just a few more.

Sociologist Andrew Greeley used surveys to study the personality, political participation, respect for democracy, and family attitudes of Irish and Italian Americans.¹⁸ He generated a series of hypotheses based on the assumption that resemblances to ancestral culture would persist for generations after immigration. For example, Irish immigrants disproportionately came from western Ireland, where rates of mass public participation in political activities were historically high; Italian immigrants mostly came from southern Italy, where political participation was low. Greeley hypothesized that rates of political participation of Irish and Italian Americans should mirror these historical differences. He found that immigrants do tend to converge toward the dominant Anglo norms in the United States, but slowly.

A study by political scientist Robert Putnam nicely complements Greeley's.¹⁹ Putnam compared the performance of regional governments in Italy after widespread reforms in the 1970s devolved important powers on elected regional governments for the first time since the creation of the highly centralized Italian state in the 1870s. Responses to this change in the institutional "environment" differed dramatically among regions. To simplify a complex and quite interesting story, the northern Italian regions rapidly built powerful, competent, and relatively popular regional government organizations, as the reforms intended. The southern regions made much slower progress. Putnam provides historical evidence that this pattern is related to an old difference between north and south. From the late medie-

val period onward, northern Italy was a collection of self-governing city-states—Venice, Milan, Genoa, and Florence, among others—with a very lively tradition of large-scale community participation in governance. Southern Italy, in contrast, was governed by a succession of autocratic foreign imperial powers that ruled through appointed elites. Today, northern Italy has many more vibrant community institutions than the south; a century of common experience with centralized, nationally uniform political organizations has not erased different political traditions evolved over several centuries.

Geert Hofstede, an applied psychologist working in an IBM training center in Europe, collected a huge sample of questionnaire data about employees' work-related values.²⁰ He obtained samples of useful size from fifty countries and a few multinational regions. The data measured workplace values related to power, gender relations, uncertainty avoidance, and individualism. One might expect selection and training as an IBM employee to dampen cultural differences, but Hofstede found ample variation remaining. Culturally related societies tended to cluster together in his sample. British, American, and Australian employees reported similar values, as did Latin American and East Asian workers.

Sudden changes in the economic or institutional environment commonly elicit unique ethnic responses. The sudden change finds some groups accidentally preadapted to the change and others not, so the groups behave quite differently. In Nigeria, the experiences of the Ibo, Hausa, and Yoruba peoples provide a good example of this phenomenon. Ibo society before colonialism had social structures that emphasized individual achievement, whereas the Hausa and Yoruba emphasized hereditary statuses with less of an emphasis on individual ambition. The growth of market economies during colonial and postcolonial times gave the traditionally more-entrepreneurial Ibo a head start in adapting to the change.²¹ A similar argument has been used to explain the striking entrepreneurial achievements of some rather simple Melanesian societies compared with seemingly more-sophisticated Polynesian societies in the same region.²² Some Melanesian societies are so precociously private-entrepreneurial-capitalist that they seem to have been invented by Milton Friedman.

These examples indicate that many important differences between human groups result from conservative, transmissible determinants of behavior—either culture, genes, or persistent institutional differences. Shortly we will present evidence that institutions cannot be the whole story in explaining these differences, and that genes play little role. First, however, we need to briefly deal with the problem of technology.

Technology is culture, not environment

Natural experiments are not the only way to refute the argument that environmental differences are the main source of human variation. Some of the most extreme proponents of ecological and economic explanations of behavioral differences (for example, the late Marvin Harris)²³ take the tool kits used by various peoples to be part of the environment. This move is especially tempting in the case of the durable environmental modifications that technology is used to construct: road networks, impressive public buildings, rice terraces, and the like have profound effects on behavior. That people with different technologies behave differently in the same environment is not seen as a problem. For example, the introduction of steel tools may have changed the human ecology of tropical horticulturalists, because such tools reduced the cost of clearing new fields, which, in turn, increased population densities and reduced the reliance on hunting. Thus, the societies of steel-using people would be different in many ways from the societies of those people who had not obtained steel technology. Some argue that this is consistent with the all-environment position, because the tools are taken as part of the environment, but surely this is cheating. The knowledge necessary to extract iron ore, smelt it into steel, and work it into useful tools is not part of the environment, and people don't acquire this knowledge by themselves in a single generation. Rather, the necessary knowledge is accumulated slowly, transmitted from one generation to another by teaching and imitation. Of course, the development of this technology will also depend on environmental factors: Is the ore available? Are the tools worth the trouble? Are populations large enough to support specialists in metalworking? However, if people do not have the necessary knowledge, then none of these factors will be relevant.

Thus, even the strongest skeptics of culture's significance must make an exception for the culturally transmitted knowledge that produces technological differences in the same environment. Many might be comfortable with technological determinist explanations granting that aspect of culture important causal power. But cracking the door of dispute this far greatly weakens the environmental determinism argument, because there is no clear dividing line between technological knowledge and other forms of knowledge. Think about public health practices, such as boiling drinking water. People who believe in the germ theory of disease typically boil drinking water drawn from polluted sources. They believe that this practice is worthwhile, even though it is troublesome, because it reduces their chances of contracting cholera, diarrhea, and many other germ-borne dis-

eases. However, as many public health workers have found, people who have other theories of disease do not readily adopt the practice of boiling drinking water.²⁴ To them, the beneficial effects of this practice are hard to observe, because people get sick for many reasons, and the costs, such as gathering extra fuel for cooking fires and purchasing containers for boiled water, are clearly evident. Thus, beliefs about the causes of disease must be considered part of a people's technological knowledge. But these beliefs are also typically tangled up with all sorts of beliefs about humanity, nature, and the supernatural.

Variation in the social environment is not enough to explain human variation

Many scholars, especially in sociology and social anthropology, would agree that human differences are not caused by differences in the natural environment, but they still reject the importance of culture. Instead, they argue that variation in the social environment, not culture, creates and maintains variation among societies. The idea here is that people's behavior depends on the behavior of others. To take a familiar example, driving on the right-hand side of the road makes sense if everyone else does the same. Once one form of behavior becomes common, it will be self-perpetuating, leading to a persistent pattern of behavior that we come to recognize as an institution. Social life, it is argued, is shot through with such institutions—marriage, familial obligations, career, and so on—and these institutions cause human societies to differ, even if they exist in the same environment.

It is important to distinguish two versions of this argument. In the strong version, everyday interactions perpetuate institutions. Driving on the right-hand side of the road is an institution in many countries, because the vast majority of people do so. The institution in question is a property of the society, not of individuals. Even if every one of us had total amnesia every time we stepped out of our car, we would rapidly relearn the proper rule once back behind the wheel. Of course, we do have the habit of driving on the correct side of the road for the country we're in, but it is a quite superficial thing. Americans and Continentals adapt quickly to driving on the left in Britain, and the Swedes switched from left to right overnight when they adapted to the Continental norm. Such "games of coordination" are self-policing. Everyone has a direct, though not necessarily quite so obvious, reason to conform to the prevailing rule, no matter what it is.

In the weaker version of the argument, people learn how to behave by observing the behavior of others. Americans do not form polygynous households because they believe that such behavior is morally reprehensible, and that polygamists will be scorned by their friends and neighbors. They acquire such beliefs through teaching, and occasionally they are reinforced when some would-be polygamist gets his (or her) just desserts.

The important point is that in the weak version, the social environment is just one form of cultural variation in the sense we define it here. People acquire and store information about how to behave by observing the behavior of others and by being taught local customs. In contrast, in the strong version, the information that perpetuates historical differences is not stored in human memory; rather, it is stored in the day-to-day behavior of individuals, enforced by the self-policing incentives of games of coordination. Perhaps such institutions are quite important compared to cultural information transmitted by imitation and stored in individuals' heads. Nevertheless, in this section we present arguments that the strong form of institutional variation cannot account for the bulk of human variation. Cultures can persist even when the chain of behavior linking the past to the present is broken, and institutional variation has difficulty accounting for persistent variation within cultures.

Cultures can “reappear” after long suppression

Ideas can be stubborn things. They often persist even when the overt behavior they prescribe is suppressed for long periods by a repressive social environment. You can test your own belief that differences are maintained by self-sustaining social interactions by conducting another thought experiment. Pick your favorite culture—say, the Mae Enga of the western highlands in Papua New Guinea. Now imagine that all of the practices that make the Mae Enga distinctive are interrupted. They are forbidden to practice their religion, their elaborate exchange rituals, and their habit of frequent violent conflict with their neighbors. Instead, a different pattern of behavior is imposed on them. However, they are not forbidden to teach their youngsters about the old Mae Enga ways. Further, imagine that this imposition persists for a generation or so, and then is removed. If you think that the Enga will continue with the patterns imposed on them, or evolve new patterns that are unrelated to their previous behavior, then you agree with the adherents of the strong institutional position that culture is unimportant. On the other hand, if you think that the new behavior of the Mae Enga will reflect their old culture in important ways, you believe that cul-

tural continuity is not maintained solely by its daily performance. Rather, it rests in longer-lived memory. If culture, not self-policing institutions, creates continuity, people of a culture might be compelled by circumstance to behave according to someone else's rules but still transmit some, much, or all of their culture to their children. If the force of circumstance disappears before the culture is readapted to the new environment, all or most of the old culture may still exist, and behavior may revert to the old ways if the compulsion is removed.

The posture of the Soviet state toward ethnic minorities provides a real, albeit brutally crude, version of this experiment. Anthropologist Anatoly Khazanov describes the history of ethnic differences and nationalism in the former Soviet Union. Between 1917 and 1979, the Soviet empire quite strenuously and ruthlessly attempted to impose the idea of a new Soviet citizenship upon all of the very diverse peoples of that vast system. Moreover, for centuries the southern republics, the Ukraine, and many ethnic enclaves within the Russian Federation had been subject to Russian cultural influence and political control under the czars. According to Khazanov, the ultimate goal of Soviet national policy from Lenin down to Gorbachev's reforms in 1985 was the complete Russification of non-Russian nationalities under the slogan "merging the nations."

True, constitutional fictions portrayed ethnic non-Russians as having well-protected rights, and ethnic figureheads existed in the republics. Realities were different. The Russian language was gradually imposed upon other nationalities through the educational system, starting with higher education and working downward over time. By the 1960s study of minority languages in the Russian Federation had nearly disappeared. Similar policies were pursued in the non-Russian republics as well. Mass-media programming, book publication, street signs, maps, and official and semi-official meetings were dominated by the Russian language by the 1970s. In addition, emigration by Russians to the non-Russian republics was encouraged. Estonia went from 92% Estonian in 1940 to 61% in 1988. In Kazakhstan and Kyrgyzstan, indigenous people became a minority. By 1980, a majority of the population in most republics were fluent Russian speakers. For non-Russian members of the Soviet elite, conspicuous Russification was a prerequisite. In many republics, the Russification of the elite caused considerable grumbling among ordinary citizens, and language issues sparked strong resistance in some republics, such as Azerbaijan and Armenia. Many important institutions were effectively suppressed by the Soviets, including Islamic mosques and schools. The Soviet government kept Islamic institutions very small and servile, much like the Orthodox Church.

The Bolshevik Revolution was undoubtedly a social revolution that aspired to be a cultural revolution molding all the Soviet peoples into a new society in which ethnicity was limited to a few quaint customs. Despite the change in social environment and rigorous attempts at Russification, the end of the Soviet empire in 1989 led to an immediate, and to some a surprising, outbreak of nationalism. According to Khazanov, Russian chauvinism itself substantially counteracted Soviet communist ideals of intercultural unity, obstructing the effort to create an international Soviet socialist culture. The subject nationalities of the Soviet system maintained a strong, if necessarily covert, resistance to attempts at assimilation on Russo-Soviet terms. Ethnic sentiments remained (or reemerged as) a strong force after decades of Soviet rule. In the Central Asian republics, the mass of citizens still considered themselves Muslims, and by the 1960s underground clergy were conducting religious rituals and maintaining Islamic schools. Even those who were not able to participate regularly in Islamic religious life maintained identification with Islam. Other hints, such as the high birthrates in the Muslim south, suggest that a large suite of values were being maintained. Changes that did occur were substantially independent of those desired by Soviet policy. Outside the Soviet Union, the durability of Catholicism and nationalism in Poland, the spirit of private economic enterprise in China, and ethnic enmities in the Balkans impress us as examples of cultural continuity over generations in the face of severe institutional repression.

The exact means by which cultures were preserved during the Soviet period and the degree to which they remained intact is an untold story. Journalist Stephen Handelman chronicled some of these for an unusual quasi-ethnic group, the traditional Russian "Mafia."²⁵ The so-called Thieves' World subculture of organized crime has deep roots in czarist Russia. The Bolsheviks of the revolutionary period had a tendency to romanticize the Thieves' World as primitive revolutionaries, and expected its members to embrace the revolution after 1917. Instead, it persisted straight through Stalin's terror, operating as similar organizations do in the United States and Italy, as much from within prison as on the outside. Incredibly, in a state that tried to control its inhabitants' lives with a large and ruthless police bureaucracy, the iron rule of the Thieves' World meant that members may never take an official job. Even a powerful police state could not destroy such an organization. The Thieves' World's crisis came in the aftermath of World War II. During the war, large numbers of participants became sufficiently caught up in the patriotic fervor of resistance to the Nazis to become soldiers. This provoked a civil war within the Thieves' World that

pitted returning soldiers against traditionalists who maintained that even service under such extreme circumstances violated the norm of no participation in legitimate organizations.

There are a number of other examples of this sort. In the United States, we have thus far utterly failed to win the war on drugs. Despite very high incarceration rates for drug offenses, and much official anti-drug use propaganda, drug subcultures are proving extremely durable in the face of repressive social environments. Another example can be found among Orthodox Christian communities that survived Ottoman repression throughout Anatolia and the Balkans.²⁶ The ability of heretical ideas to persist in Europe in the medieval and early modern periods, despite persecution by Catholic and Protestant authorities, kept a yeasty brew of beliefs and practices alive for centuries, and contributed to movements such as Masonry and Mormonism on the nineteenth-century American frontier.²⁷

A mere disruption of the overt expression of culture will often fail to erase it. This does not mean that cultures are immutable; situations exist in which the desire to assimilate exceeds loyalty to tradition. However, socialization by parents and the willingness of priests and patriots to maintain underground organizations even at considerable risk to themselves can perpetuate substantial portions of a traditional culture in an extremely hostile and radically altered social environment. Culturally transmitted ideas do seem sufficient to reconstruct functioning social systems, even after long periods of suppression, which clearly falsifies the strong version of the institutional argument.

Social environment explanations have difficulty accounting for variation within groups

Not all people who live together are the same, and evidence suggests that culture plays a role in the differences. For example, the patterns of ethnic variation within the farm communities studied by Salamon are similar to those *among* communities.²⁸ Salamon studied the community of “Prairie Gem,” which was settled by a mixture of Yankees and German immigrants. In 1890, Germans owned about 20% of the land; by 1978 they owned about 60%. In 1978, 66% of the absentee owners were Yankees, and only 43% of the resident owners were Yankees. Thus, Yankees living side by side with Germans in the same community behave much as they behave when they live in separate communities. A similar contrast exists in the predominantly Swedish community “Svedburg.” The Swedes share with the Ger-

mans a strong commitment to keeping their farms in the family, and they are more likely to help their sons get started in farming than are Yankees. For example, 62% of the Swedes who were renters or part owners obtained their land with their father's help, while less than a quarter of the Yankee renters received parental assistance.

This kind of variation is difficult to explain in purely social-structural terms. In the cases where Germans or Yankees dominate a community, one might imagine that some institutional hypothesis could explain behavioral variation. But the Yankees and Germans of Prairie Gem interact every day—be it for business or social reasons. They farm the same soils in the same economic climate using the same technology. The only thing that distinguishes them is their ethnic heritage. How could day-to-day interaction in Prairie Gem motivate Germans to farm one way and Yankees to farm another way unless they had different culturally transmitted ideas, beliefs, and values?

Little behavioral variation between groups is genetic

Most people we know are rather immoderate on the question of whether behavioral differences among humans have a genetic basis. Many of our colleagues consider the question to be settled: there is no important genetic variation affecting behavior, and anybody who says that there is must have odious motives. At the same time, many of our friends and relatives seem to be thoroughgoing hereditarians. They say that their children get their good nature and quick wit from their parents, and they also say, particularly in unguarded moments, that the members of other ethnic groups are “born” different.²⁹ People are also usually confused, despite their passion, by the nature/nurture dichotomy.

We think that typical academics' beliefs about the heredity issue are barely better informed than folk psychology. Recent research in behavior genetics suggests that some behavioral variation among individuals has a substantial genetic component and a substantial environmental component. However, these results provide no evidence that variation among *groups* has any genetic component. Moreover, compelling natural experiments suggest that virtually none of the behavioral differences we see among the peoples of the world have a genetic basis.

Behavior genetics suggests that some differences among individuals are partially genetic

Most people think that children get basic values from their parents. Little Phyllis learns to condemn abortion from her conservative parents, while little Tom learns to favor a woman's right to choose from his liberal ones. This common view has long been endorsed by social science; innumerable studies show the similarity in attitudes of parents and offspring, and almost everyone³⁰ has assumed that this is because children learn social attitudes at home.

However, research by behavior geneticists casts doubt on the common view. The social attitudes of parents and offspring are correlated, all right, but these correlations result from genes that the children inherit.³¹ These investigators administer questionnaires to large numbers of people, including identical twins, fraternal twins, related and unrelated people who lived in the same household during their childhood, and relatives who live in other households. There have been a number of different studies, but in each case all subjects were white middle-class citizens of a single country, either Australia, the United Kingdom, or the United States. The questions elicit attitudes toward topics such as modern art, capital punishment, and pajama parties. Statistical methods are used to cluster the answers into personality dimensions that psychologists label introversion-extroversion, neuroticism, psychoticism, religiosity, and conservatism.³² Much work in psychology suggests that these dimensions tap fundamental aspects of personality. The importance of genetic and cultural transmission within the family is measured by statistically comparing the social attitudes of people who have the same family experience but different degrees of genetic similarity. For example, if learning from parents predominates, then pairs of adopted children, siblings, fraternal twins, and identical twins ought to be equally similar. If genetic transmission is most important, then identical twins should be most similar. Fraternal twins and siblings should be somewhat similar, while adoptees and their adopted relatives ought to be no more similar than any two people in the sample.

Results from several independent studies suggest that cultural transmission within the family is not very important; the similarity between parents and offspring is mainly due to genes. If these results stand up and generalize to other sorts of characters, then it would tell us that parents are less important in cultural transmission than many people suppose. Little Phyllis apparently abhors Democrats partly because she inherited genes from her parents that predispose her to adopt conservative views, and in part be-

cause of what she learns or observes or acquires by chance outside the family. While these studies have been criticized on a number of grounds,³³ the claim that there are heritable genetic differences among people is quite plausible. It is a truism among evolutionary biologists that all kinds of continuously varying traits show substantial genetic variation, including behavioral traits like the tendency of rodents to explore a cage, pigeons to return home, or dogs to “point.” Given that the propensity of people to adopt one social attitude over another is likely affected by many aspects of brain chemistry and organization, and given that such aspects of the brain are likely affected by many different genes, it is certainly plausible that some of the variation in people’s responses on a questionnaire, as well as perhaps their behavior, is affected by genetic variation. Indeed, if humans had *no* genetic variation at the individual level, we would be something new under the sun.

However, the existence of genetic variation does not mean that cultural transmission is unimportant. In most of the studies more than half of the variation in children’s personality is associated with what behavior geneticists call nonfamily environment, which they interpret as the effects of the idiosyncratic events of individual lives. In this scenario, Joe had conservative parents, but is pro-choice because a good friend died as a result of an illegal abortion. But this is not the only sensible interpretation; the non-family environment could equally well be due to the effects of learning from other individuals: friends, clergy, fraternity brothers or sorority sisters, colleagues, and perhaps even professors. Since the behavior geneticists know only the attitudes of parents, they cannot exclude this interpretation of their results. Joe may have learned his views about abortion from a charismatic teacher. Moreover, this interpretation is consistent with the fact that the effect of family environment on some traits, most notably IQ, is fairly high for small children and then decreases as subjects approach adulthood. As the number of different individuals influencing a child’s attitudes increases, the parental effect decreases until it drops below the level of resolution of the methods used in these studies.

Dialect variation is one example of a cultural system that is strongly influenced by nonfamily environment. Sociolinguists know a lot about the genesis of small-scale variations in dialect.³⁴ Children almost always learn their native language from their parents at home. However, as youngsters leave the household to interact with peers, they almost always switch their dialect from that of their parents to that of their peers. This is true of language evolution, which is led by younger people, whose dialect is detectably different from that of the older generation. It is also true of people

who migrate across linguistic boundaries or gradients. Adults often struggle to conform to the norms of a new region, whereas younger children adjust completely. In terms of dialect *variation*, parents have almost no effect on children even if primary language socialization is, as it seems to be, *overwhelmingly* familial! If it happened to turn out (studies are lacking as far as we know) that innate vocal tract anatomy has a modest effect on dialect performance, then a dialect variable would have the same pattern as personality variables. There would be a genetic effect of parents acting through the heritability of anatomical features and a nonfamily environment effect due to dialect learning. The parents' large role in socialization disappears from view in this case even if most early language skills are learned from parents. In essence, parents normally transmit basic language traits to children, but the kids in turn acquire from peers the nuances that make up the variation.

High heritability within groups says nothing about variation between groups

Let's suppose that after much careful research, every sensible person was convinced that variation in social attitudes among white, middle-class Americans was largely due to genetic differences. For many people, this would imply that social attitudes are genetically transmitted. Obviously, social attitudes differ substantially among different populations—Scandinavians differ from Americans, who differ from Germans, and so on. If social attitudes were genetically transmitted within each society, wouldn't it follow that the variation in social attitudes that exist among groups are also genetic?

Our answer is a very testy NO!! That much of the variation in social attitudes among white, middle-class Virginians is genetic does not mean that social attitudes are genetically transmitted. It means that there is genetic variation which affects social attitudes, and that these effects are large compared with the effects of cultural and environmental differences among white, middle-class Virginians. It does not say that the differences in social attitudes between white, middle-class Virginians and, say, white, middle-class Danes are the result of genetic differences between these two groups. That would be true only if two quite different conditions held: first, a genetic difference must exist between Virginians and Danes *on the average*, and second, this average genetic difference must be large compared with the average difference in culture and environment between the two groups. That there is genetic variation *among* Virginians does not tell us whether they are genetically *on average* different from Danes. Nor does the relative

lack of environmental or cultural variation among Virginians tell us anything about the average difference in environment or culture between Virginians and Danes.

This is not rocket science; it is just common sense. Behavioral geneticists themselves are usually careful to underline the distinction between heritable differences within populations and those between populations.³⁵ Nonetheless, year after year undergraduates—and, alas, sometimes scientists who should know better—leap to the conclusion that differences among groups are genetic even though they all are familiar with evidence that ought to convince them of the opposite. It is to this evidence that we now turn.

Little behavioral variation among groups is genetic

Two kinds of evidence show that much of the behavioral differences among groups are not genetic. First, individual cross-cultural adoptees behave like members of their adopted culture, not the culture of their biological parents. Second, groups of people often change behavior much more rapidly than natural selection could change gene frequencies. These data are far too coarse to prove that there are *no* genetic differences between human groups, but we believe the evidence is sufficient to conclude that the cultural differences between groups are much larger than any genetic variation that might exist.

Cross-cultural adoption

In recent years, cross-cultural adoption has become fairly common. Japanese, Korean, and Vietnamese children have been adopted into American families, Navaho children have been adopted into Mormon families, and Latino children have been adopted into Anglo families. If the differences between, for example, Korean society and American society were caused by genetic differences between the two groups, adopted children would grow up with the beliefs, values, and attitudes of their biological parents. But, of course, this is not what happens. Adopted kids grow up with beliefs, values, and attitudes of the culture in which they are raised.

Only a few good studies of transcultural, especially transracial, adoptions exist, with³⁶ developmental psychologist Lois Lydens's study of 101 Korean children adopted by white American families being one of the best. Her sample included 62 children adopted before the age of one year and 39 adopted after the age of six, most of whom became wholly acculturated,

successful “white” Americans. Adoptees develop perfectly healthy self-concepts, for example, differing little from the normal calibration sample employed in constructing the clinical test used. Children adopted later in life showed some significant deficits on subscales of the test that reflect self-certainty, global self concept, and adjustment in adolescence, but most of these effects had disappeared at the time of a retest in early adulthood. Even in adulthood, older adoptees had measurably, but only slightly, poorer feelings about their families than children adopted at younger ages. Lydens’s sample clearly shows that growing up as a racial minority in a society with a significant amount of racial prejudice has some effects. For example, young adult adoptees had slightly below-normal satisfaction with their physical appearance. In free-form questions, both children and parents cited prejudice as a significant problem in the lives of the transracial adoptees.

The most striking thing is how little effect such prejudice had on the overall self- and even ethnic concepts of transracial adoptees. Many parents took care to be supportive of kids learning about their birth ethnic group, but few adoptees showed much sign of interest. Those that did were predominantly older adoptees. The adopted children studied were raised in mostly conservative religious homes with a strong commitment to making the adoptions work. As young adults, the adoptees were quite successful, with only four not graduating from high school and two unemployed. If there were big population-level genetic effects on behavior, one would predict that populations as distantly related as those from far western and far eastern Eurasia would encompass a fair fraction of the total human variation, and some detectable departures from Euro-American norms would turn up in Korean adoptees in the United States. Instead, adopted Koreans make perfectly assimilated Americans, except for the surprisingly minor hitch introduced by racism.

The ideal transcultural adoption “experiment” would include reciprocal adoptions. Would Anglo American kids adopted by Koreans make well-assimilated Koreans? Koreans, as it turns out, generated a one-way flow of adoptees to the United States because they oppose adoption outside the family. However, Anglo Americans did historically contribute a number of involuntary adoptees to American Indian parents, who are historically derived from northeast Asian populations. The aggressive frontier settlement of Anglo Americans generated the well-documented conflicts between these peoples, and as everyone knows, the Europeans often lost. This was particularly true during the long preindustrial period before 1776 when the frontier was only slowly moving westward. Victorious Indians often took

captives; adult captives were normally killed, but children and adolescents were often adopted. Most often, Indian couples who had lost children took captives, mostly between five and twelve years of age, to replace them—swift-moving warriors were seldom able to manage infants and toddlers. Very strenuous efforts were made by whites to retake or ransom captives, even many years after the event, and French and British Canadians often helped American families recover captives from their tribal allies. Sometimes individuals who had been adopted at an early age and had lived decades as adoptees were recovered by their natal families following a serious, often final, defeat by the invading Anglo Americans. The pathos of the captives' stories led to a well-developed nonfictional (and fictional) literature detailing the experience, from which a fair sample of well-documented cases can be reconstructed.³⁷

Historian Norman Heard assembled a sample of fifty-two captive accounts, weighted toward those in which adoptions took place, and in which information about the age, national origin, duration of captivity, and outcome of captivity were reasonably reliably recorded. The story of Cynthia Ann Parker is typical. She was taken captive at age nine in 1836 when a large party of Comanche and allies seized her father's trading fort in Texas. She had been taken along with three others, but they were redeemed fairly promptly. Eventually, Cynthia Ann was adopted by a Comanche family and lived twenty-four years with them. She married a chief and had three children, one of whom, Quanah, became an important chief in his own right. By Heard's estimate, Cynthia Ann became 100% Indian. In 1860 she was "redeemed" by a Texas Ranger and sent to live with an uncle, from whom she tried to escape several times. Although she regained the use of English and adapted to Anglo life, she retained her emotional attachment to the Comanche. Her "redemption" amounted to a second kidnapping, one to which she was too old to adapt. After the death of her little daughter, who was "redeemed" with her, Cynthia Ann fell into a depression and died herself.

In Heard's sample, age at capture, duration of capture, and type of treatment influenced whether assimilation to Indian life occurred. Young captives treated well for any length of time assimilated. Living with Indians into adulthood, especially forming an Indian family, generally resulted in individuals whose entire ethnic identification lay permanently with their adoptive group, as with Cynthia Ann Parker. Older children, treated badly and recovered shortly, generally remained essentially white, though a few teenage boys found the free and easy life of the Indians preferable to the straight-laced, hardworking Calvinism of their birth communities. "Good

treatment” almost invariably meant formal adoption by an Indian family. Adopted individuals were treated with the same love and affection as Indian children and acquired the same rights and duties as any other member of the community. Western Indians sometimes kept child captives as domestic menials rather than adopting them, and the degree of assimilation of such captives, when they survived, was substantially reduced. Adopted children might lead a hard life for some period before they chanced to be adopted, and dated their real integration into the Indian community to adoption, not capture per se. Indian communities were only mildly racist, so physical difference between adoptees and birthright Indians was not a major handicap.³⁸ Among adoptees of Indians, the reminiscences of the strong emotional bonds to adoptive families primarily and their adoptive culture secondarily are remarkably parallel to those quoted by Lydens from the questionnaire responses of her Korean adoptee subjects.

In short, most children adopted into another culture before the age of ten or so, even with a history of traumatic capture or indifferent orphanage upbringing, will fully assimilate emotionally into another culture and become fully functional members of it. This result is not surprising to most people. Nonetheless, it is an extremely strong test of the theories under consideration here. If the behavioral differences between groups were substantially due to genetic differences, adoptees should show significant departures from norms of behavior of their foster culture.

Rapid cultural change

Many people erroneously think that natural selection always takes millions of years to do its work, but several lines of evidence suggest that it can act much more quickly. First, biologists have actually observed rapid evolutionary change in short periods of time. For example, a drought in the Galapagos reduced the availability of small, soft seeds preferred by one species of Darwin's finches. Careful studies by biologists Peter and Rosemary Grant³⁹ showed that those birds with thicker beaks were better able to process the larger, harder seeds that were available, and as a result were more likely to survive, and that beak thickness was heritable. Beak depth changed 4% in two years, a rate sufficient create a new species in less than forty years.⁴⁰ Artificial selection demonstrates that such changes can go on long enough to result in major changes in behavior and morphology. For example, all breeds of dogs are probably descended from wolves during the last fifteen thousand years. This means that artificial selection can change a wolf into a Pekinese in a few hundred generations. Finally, the fossil record

indicates that substantial morphological change sometimes occurs on the timescale of a few thousand generations. At the beginning of the last interglacial period, about 120,000 years ago, rising sea levels caused the island of Jersey to be isolated from the European mainland. Fossil evidence shows that within six thousand years, the size of red deer (or in American nomenclature, elk) on the island had decreased by a factor of 2—in about one thousand generations, natural selection shrank red deer to the size of a large dog.

Human cultures can change even more quickly than the most rapid examples of genetic evolution by natural selection. We are all familiar with the frantic pace of cultural change during this century, and while this pace is unusual, it is not unique. For example, the complex artifacts, institutions, and behaviors we associate with the Plains Indians arose *after* the introduction of horses to the southern Great Plains by Spanish frontiersmen in northern Mexico in about 1650.⁴¹ Before that time, the Great Plains were sparsely populated, because nomadic buffalo hunting was not a very productive subsistence strategy for foot hunters. Mounted hunters could match the mobility of the buffalo and reliably slaughter them in numbers. With the arrival of horses, people poured out onto the plains. From the East came people like the Crow, Cheyenne, and Sioux, who abandoned sedentary farming in river valleys where they had lived in large villages with kin-based clans and complex, large-scale political organization. From the West came nomadic hunter-gatherers such as the Comanche, and from the North came forest foragers like the Cree. These hunter-gatherers had lived in small family groups without permanent villages, complex kinship systems, or substantial political organization. During the late eighteenth and early nineteenth centuries, Great Plains tribes from the East, West, and North evolved a quite new way of life. During the summer, people who had spent the winter in small family groups gathered together in large groups for hunts and ceremonies. There, most tribes were governed by “police societies,” a kind of political institution without close parallel in either the farmers of the East or the foragers of the West.

To be sure, different tribes carried many traces of the past—the Crow were matrilineal like their ancestors, while the Comanche had the flexible kinship system characteristic of their ancestors, but to a remarkable degree a wholly new economic and social system arose in less than twelve generations. Natural selection could not act so quickly, and so the original differences could not have been genetic. The possibility of diffusion of cultural innovations across group boundaries means that whole societies can, under favorable circumstances, acquire these innovations very rapidly. Once

introduced into a group, obviously useful innovations will be imitated by everyone within a generation, more or less. Horses and riding spread rapidly beyond the Spanish frontier, and the various horse tribes traded innovations in social organization back and forth. We could use many other examples to illustrate the point. Behavioral change in human populations is very often too rapid to be easily explained by natural selection, and the intersocietal pattern of spread of the innovations is in any case inconsistent with a genetic explanation for the spread of a favored new behavior.

Much culture is not evoked

In their critique of what they characterize as the culture-saturated “Standard Social Science Model,”⁴² evolutionary psychologists Leda Cosmides and John Tooby introduced the distinction between “epidemiological” and “evoked” culture. Epidemiological culture refers to what we simply call culture—differences between people that result from different ideas or values acquired from the people around them. Evoked “culture” refers to differences that are not transmitted at all, but rather are evoked by the local environment. Cosmides and Tooby argue that much of what social scientists call culture is, instead, evoked. They ask their readers to imagine a jukebox with a large repertoire of records and a program that causes a certain record to be played under particular local conditions. Thus, all the jukeboxes in Brazil will play one tune and all those in England will play another tune, because the same gene-based program orders up different tunes in different places. Tooby and Cosmides believe that anthropologists and historians overestimate the importance of epidemiological culture, and emphasize that much human variation results from genetically transmitted information that is evoked by environmental cues.

They are led to this conclusion by their belief that learning requires a modular, information-rich psychology. Cosmides, Tooby, and some other evolutionary psychologists⁴³ think that general-purpose learning mechanisms (like classical conditioning) are inefficient. When the environment confronts generation after generation of individuals with the same range of adaptive problems, selection will favor special-purpose cognitive modules that focus on particular environmental cues and then map these cues onto a menu of adaptive behaviors. Evidence from developmental cognitive psychology provides support for this picture of learning—small children seem to come equipped with a variety of preconceptions about how the physical, biological, and social world works, and these preconceptions shape how

they use experience to learn about their environments.⁴⁴ Evolutionary psychologists think the same kind of modular psychology shapes social learning. They argue that culture is not “transmitted”—children make *inferences* by observing the behavior of others, and the kind of inferences that they make are strongly constrained by their evolved psychology. Linguist Noam Chomsky’s argument that human languages are shaped by an innate universal grammar is the best-known version of this argument, but evolutionary psychologists think virtually all cultural domains are similarly structured.

For example, cognitive anthropologist Pascal Boyer argues that much religious belief derives from human psychology, not cultural transmission.⁴⁵ The Fang, a group in Cameroon studied by Boyer, have elaborate beliefs about ghosts. For the Fang, ghosts are malevolent beings that want to harm the living; they are invisible, they can pass through solid objects, and so on. Boyer argues that most of what the Fang believe about ghosts is not transmitted; rather, it is based on the innate, epistemological assumptions that underlie all cognition. Once young Fang children learn that ghosts are sentient beings, they don’t need to learn that ghosts can see or that they have beliefs and desires—these components are provided by a sentient-being cognitive module that reliably develops in every environment. Like Cosmides and Tooby, Boyer thinks that many putatively cultural religious beliefs arise because different environmental cues evoke different innate information. Your neighbor believes in angels instead of ghosts because he grew up in an environment in which people talked about angels. However, most of what he knows about angels comes from the same sentient-being cognitive module that gives rise to Fang beliefs about ghosts, and the information that controls the development of this machinery is stored in the genome, an organism’s genetic material. Cognitive anthropologist Scott Atran makes a similar argument for ecological knowledge.⁴⁶

This picture of culture is a useful antidote to the simplistic view that culture is simply poured from one head into another. These scholars are surely right in stating that every form of learning, including social learning, requires an information-rich innate psychology, and that much of the adaptive complexity we see in cultures around the world stems from this information. However, ignoring transmitted culture completely is a big mistake. As we will see in chapter 4, the single most important adaptive feature of culture is that it allows the gradual, cumulative assembly of adaptations over many generations, adaptations that no single individual could evoke on his or her own. Cumulative cultural adaptation cannot be based directly, or in detail, on innate, genetically encoded information.

Evolutionary psychologists argue that our psychology is built of complex, information-rich, evolved modules that are adapted for the hunting and gathering life that almost all humans pursued up to a few thousand years ago. On this argument, humans can easily and naturally do the things we're adapted to do, like learn a language. Learning subjects such as differential calculus is much harder, and evolutionary psychologists are probably willing to make exceptions for modern societies and admit that cumulative evolved culture matters there. But what about hunting and gathering? Couldn't we learn that as easily as we learn language? Doesn't our brain contain the information necessary to follow hunting and gathering ways? Our lineage has lived as hunter-gatherers of some kind or another for the last two million or three million years. If we had to do so, couldn't we reinvent the things it takes to survive as a hunter-gatherer, in the same way that children reared in a multilingual community of immigrants are supposed to be able to invent a new language in a single generation?⁴⁷

Good questions, but we think the answer is almost certainly "Are you nuts?!" Consider another thought experiment. Suppose we are stranded in some not-too-extreme desert environment (not the central Sahara or the Empty Quarter of Arabia). Our task is to survive and raise our kids. Deserts are fairly harsh environments, but harsh environments were the Pleistocene norm, and we know that hunting-gathering societies have adapted well to all but the harshest. We have spent considerable time in deserts. Like successful hunter-gatherers, we know a lot about their natural history compared to the average person, and have a good generic knowledge of how hunter-gathers exploit them. We're used to camping out and are fairly fit (in consideration of middle-age infirmities, allow us to begin this experiment twenty-five years ago). However, we certainly don't command any practiced hunter-gather skills. If such skills are needed to survive as hunter-gatherers in deserts, they had better be lying quietly, heretofore little used, in innate modules in our heads. Give us the resources to survive a few months in our new home before you take away our last steel tool and last can of beans—a little time to see what comes naturally.

Would we make it? Consider a typical desert subsistence task—crossing a long dry stretch of desert from one water source where resources are exhausted to another where they may be better. We have a particular trek in mind, from Sonoita in northwestern Mexico to Yuma, Arizona, on the Colorado River. The distance is about one hundred miles, and there are several fairly reliable "tanks" along the route where water can usually be had. We have a pretty good idea where these are, but have not actually taken the trouble to fix their locations precisely on past trips. Desert peo-

ples have a number of tricks to find stored water so that they can survive these treks. In the American Southwest, they included using barrel cacti as emergency water sources, finding small “perched” aquifers in sandy wash bottoms, killing animals that have blood for drinking and wet flesh for eating, and so forth. Knowing this, we set out.

What are our chances of getting to Yuma alive? We guess only fair. Desert water holes are not easy to find unless you know exactly where to look. The locally adapted hunter-gatherer would know which birds need open water and could use them as clues for the distance and direction to water. Ditto for mammals that create a web of tracks centered on the tanks. We could use this kind of information if we had the skill to interpret the signs. Some plants that grow near water are visible at great distances—but only if you know what to look for. In our experience, a year is precious little time to come to know much about the habits of even one species of animal by personal observation, let alone many. We have read about all of the things we describe here, but it is only book learning—it tells us it’s possible to do these things, but doesn’t really provide much help in acquiring the skills we’d need to do them. We may find a way to craft some sort of canteen or water skin to transport water between tanks, but figuring out how to make such implements would take some time, and we will have many things to learn in our months of grace. The famous barrel cacti sound promising and are moderately abundant. But are all species useful? In all seasons? After a year of below-normal rain? Is this a year of normal rain or not? Lacking steel tools, how do you get past those pesky spines? Or is the barrel cactus idea mainly a legend of little or no practical utility? Even though we know where to start and we’ve read a lot of books and had months to practice, this trip is going to be an adventure to say the least.

In fact, the trip we describe is along the Camino del Diablo, “Devil’s Road”—a bad stretch of the main land route from Old Mexico to California, used until the arrival of the railroad. For more than a century, Spanish, Mexican, and American travelers used El Camino del Diablo routinely. To get that far, every traveler had to be an experienced frontiersperson already, and no doubt most were hard-bitten, desert wise, and well equipped with familiar technology. It was the best of several bad routes and was comparatively well known and well marked. Still, it was an infamous leg of the journey, with more than its share of hasty graves dug alongside.

The Camino del Diablo area was also home to Tohono O’odam Indians, who not only traveled across the region but made a living there. If we were to do the same, we’d have to confront a succession of challenges, each of which is the same magnitude as our simple trek. Mastering them all, even

starting with a goodly bit of relevant theory and some desert experience, doesn't seem to us a likely thing at all. Ethnographers remark on the subtlety of desert hunting and the complexity of hunting knowledge, belying the relative simplicity and paucity of the tools desert hunters use. A few pounds of wood, stone, and bone equipment is all you need, but you have to command a rather impressive amount of hard-won practical knowledge about natural history and have a system of supporting social institutions to make a go of it. We know from archaeology that the refinement of hunting and gathering technology to harsh environments of the high Arctic by the Eskimo and their predecessors took about eight thousand years. The same timescales obtain in provident environments like California, where the productive salmon- and acorn-based economy took about the same amount of time to evolve.⁴⁸ We think it very likely easier to acquire the skills required for hunting and gathering than to learn calculus, and this suggests that we may have some innate propensities for this lifestyle. Ethnographic accounts (and a bit of introspection) lead us to believe that most kids would rather spend time fiddling about with bows and arrows than practicing multiplication tables or mastering long division. But we'd trade a few hours of tutoring by a traditional Tohono O'odam for any number of months of trying to summon an innate knowledge of the desert if our task were to get to Yuma via the Camino del Diablo. (Untutored, it is an interesting junket if you have an SUV, five gallons of water, a full tank of gas, and permission from Barry Goldwater Bombing Range.)

Cultural adaptations evolve by the accumulation of small variations

There is yet another way that some evolutionary psychologists downplay the role of culture. For example, psycholinguist Steven Pinker writes,

A complex meme does not arise from the retention of copying errors. It arises because some person knuckles down, racks his brain, musters his ingenuity, and composes or writes or paints or invents something. Granted the fabricator is influenced by ideas in the air, and may polish draft after draft, but neither projection is like natural selection.⁴⁹

The idea here is that complex cultural adaptations do not arise gradually and blindly as they do in genetic evolution. New symphonies don't appear bit by bit as a consequence of the differential spread and elaboration of slightly better and better melodies. Rather, they emerge from people's

minds, and their functional complexity arises from the action of those minds. The same goes for novels, paintings, and inventions, or so Pinker thinks. Culture is useful and adaptive because populations of human minds store the best efforts of previous generations of minds.⁵⁰

On this view, culture is like a library. Libraries preserve knowledge created in the past. Librarians shape the contents of libraries as they decide which books are bought and which are discarded. But knowing about libraries and librarians does not help us understand the complex details of plot, character, and style that distinguish a masterpiece from a potboiler. To understand these things, you have to learn about the authors who wrote these books. How does universal human psychology shape the nature of storytelling? And how was the psychology of particular authors affected by their environments? In the same way, cultures store ideas and inventions, and people's "decisions" (often unconscious) about which ideas to adopt and which to reject shape the content of a culture. However, to understand a new complex, adaptive cultural practice, a new tool or institution, you have to understand the evolved psychology of the mind that gave rise to that complexity, and how that psychology interacts with its environment.

Students of the history of biology will recognize this picture of cultural evolution as similar to a frequently popular but incorrect theory of genetic evolution. Very few of Darwin's contemporaries accepted (or even understood) his idea that adaptations arose through the gradual accumulation of small variations. Some of his most ardent supporters, like T. H. Huxley, thought that new adaptations arose in big jumps, and then natural selection accepted or rejected these "hopeful monsters." In this century, biologist Richard Goldschmidt and paleontologist Stephen Jay Gould among others championed this theory of evolution.⁵¹ It is wrong because the likelihood that a complex adaptation will arise by chance is vanishingly small. Of course, this objection does not have the same force for cultural evolution, because innovations are not random; and thus cultural evolution could conceivably mainly involve the culling of complex innovations, innovations that have to be understood only in terms of human psychology.

If complex culturally transmitted adaptations were mainly hopeful monsters, then the study of the population dynamics of ideas would be of some interest because it would help us understand why some hopeful monsters spread and others fail. However, population-based theory is much more important if most complex cultural adaptations were assembled by the gradual accumulation of small variations like organic adaptations. And, the evidence convinces us that this is exactly the way most cultural change occurs.

Culture usually evolves by the accumulation of small variations

Isaac Newton famously remarked that he stood on the shoulders of giants. For most innovators in most places at most times in human history, a different metaphor is closer to the truth. Even the greatest human innovators are, in the great scheme of things, midgets standing on the shoulders of a vast pyramid of other midgets. The evolution of languages, artifacts, and institutions can be divided up into many small steps, and during each step the changes are relatively modest. No single innovator contributes more than a small portion of the total, as any single gene substitution contributes only marginally to a complex organic adaptation. The limited imitative capacities of other animals seem to prevent the cumulative evolution of complex cultural features. At best, some chimpanzee innovations such as the use of hammers and anvils for cracking nuts may represent a two-step accumulation.⁵²

The case of language illustrates the general principle that the cumulative effect of many small changes can be a powerful source of cultural change. In some cases, only a few differences of phonology, syntax, and lexicon separate closely related dialects. Careful dialect descriptions conducted in the United States in the 1930s allow contemporary linguists to describe in some detail the generation-to-generation change in language.⁵³ In one generation some dialect changes are rapid enough to be detectable to the trained ear. For example, New Yorkers are gradually tending to pronounce *r* at the end of words like *car* more often. Over time, these small changes accumulate. Without the benefit of an expert's notes, most of us miss many subtleties in Shakespeare's plays, and Chaucer is nearly impossible to follow. Still, to a comparative philologist, Middle English is closely related to Modern English. Modern English is even appreciably related to ancient Indo-European via a collection of words such as *agras* = field, from which the English *agrarian* is derived, which have cognates scattered across central and western Eurasia.

Most readers, we are sure, come to this book with the intuition that individual humans are pretty smart, and that this is mainly what is responsible for most of the spectacular accomplishments of our societies. However, there is much evidence that suggests that this view is wrong.⁵⁴ Psychological studies of human decision making indicate that human rationality is narrowly bounded. Human decisions and the psychological reasons that underlie those decisions are a fundamental part of cultural evolution.⁵⁵ We don't mean to denigrate individual human agency at all, merely scale it against the complexity of cultural adaptations arrived at by the cul-

tural evolutionary process operating over considerable reaches of time and space.

The history of technology⁵⁶ shows that complex artifacts such as watches are not hopeful monsters created by single inventors. The watchmakers' skills have been built up piecemeal by the cumulative improvement of technologies at the hands of many innovators, each contributing a small improvement to the ultimately amazing instrument. Many competing innovations have been tried out at each step, most now forgotten except by historians of technology. A little too loosely, we think, historians of technology liken invention to mutation because both create variation, and compare the rise to prominence of the successful technology with the action of natural selection.⁵⁷ Forget watches for a moment. The historian of technology Henry Petroski documents how even simple modern artifacts like forks, pins, paper clips, and zippers evolve haltingly through many trials, some variants to capture the market's attention and others to fall by the wayside. No one knows how many failed designs languished on inventors' workbenches.⁵⁸ Most of the rest of this book is about how things are more complicated than bare-bones random variation and selective retention. To anticipate our argument, the decisions, choices, and preferences of individuals act at the population level as forces that shape cultural evolution, along with other processes like natural selection. We urge great care with loose analogies to mutation and selection because several distinct processes rooted in human decision making lead to the accumulation of beneficial cultural variations, each with a distinctive twist of its own and none exactly like natural selection.

While human innovations are not like random mutations, they have been small, incremental steps until recently. The design of a watch is not the work of an individual inventor but the product of a watch-making tradition from which the individual watchmaker derives most, but not quite all, of his design. This is not to take anything away from the real heroes of watch-making innovation, such as John Harrison. Harrison delivered a marine chronometer accurate enough to calculate longitude at sea to the British Board of Longitude in 1759. He used every device of the contemporary clockmaker's art and a number of clever tricks borrowed from other technologies of the time, such as using bimetallic strips (you have seen them coiled behind the needle of oven thermometers and thermostats) for compensating the critical temperature-sensitive timekeeping elements of his chronometers. His achievement is notable for the sheer number of clever innovations he made—the bimetallic temperature compensators, a superb escapement, jewel bearings requiring no lubrication, substitutes for the

pendulum. It is also notable for his extraordinary personal dedication to the task. By dint of thirty-seven years of unremitting effort and a first-rate mechanical mind, sustained by incremental payments against a British Admiralty prize he was a good candidate to win, Harrison made a series of ever smaller, better, more-rugged seagoing clocks. Eventually he delivered “Number 4,” with an accuracy of better than 1/40th of a second per day, a significant improvement over one minute per day for the best watches of his time.⁵⁹ Only the rarest of inventors makes an individual contribution of this magnitude. Yet, like every great inventor’s machine, Number 4 is a beautiful homage to the art and craft of Harrison’s predecessors and colleagues as much as to his own genius. Without a history of hundreds or thousands of ancient and mostly anonymous inventors, he would not even have conceived the idea of building a marine chronometer, much less succeeded in building one. The eighteenth-century theologian William Paley’s famous Argument from Design would better support a polytheistic pantheon than his solitary Christian Creator; it takes many designers to make a watch.

Consider a much simpler nautical innovation, the mariners’ magnetic compass. Its nameless innovators must have been as clever as Watt, Edison, Tesla, and the other icons of the Industrial Revolution whose life stories we know so much better.⁶⁰ First, someone had to notice the tendency of small magnetite objects to orient in the earth’s weak magnetic field in nearly frictionless environments. The first known use of this effect was by Chinese geomancers, who placed polished magnetite spoons on smooth surfaces for purposes of divination. Later, Chinese mariners built small magnetite objects or magnetized needles that could be floated on water to indicate direction at sea. Ultimately, Chinese seamen developed a dry compass with the needle mounted on a vertical pin bearing, like a modern toy compass. Europeans acquired this form of compass in the late medieval period. European seamen developed the card compass, in which a large disk was attached to a pair of magnets and marked with thirty-two points. This compass was not merely used to indicate direction but was rigidly mounted at the helmsman’s station, with a mark on the case indicating the bow of the ship. Now the helmsman could steer a course as accurate as 1/64th of a circle by aligning the bow mark on the case with the appropriate compass point. Compass makers learned to adjust iron balls near the compass to zero out the magnetic influence from the ship, an innovation that was critical after steel hulls were introduced. The first such step was a small one: replacing the iron nails of the compass box with brass screws. Later, the compass was filled with a viscous liquid and gimbaled to damp the ship’s

motion, making the helmsman's tracking of the correct heading still more accurate. Thus, even such a relatively simple tool as the mariner's compass was the product of numerous innovations over centuries and in space by the breadth of Eurasia.⁶¹

Other aspects of culture are similar. Take churches. Modern American churches are sophisticated organizations that supply social services to their parishioners.⁶² The successful ones derive from a long tradition of incorporating good ideas and abandoning bad ones. Surprisingly, one of the unsuccessful ideas turns out to be hiring educated clergy. College-educated clergymen are good intellectuals, but too frequently deadly dull preachers, consumed with complex doubts about the traditional verities of Christian faith. In the United States, successful religious innovation is handsomely rewarded due to the free-market character of certain Protestant religious institutions. Many ambitious religious entrepreneurs organize small sects, mostly drawing upon a set of stock themes called fundamentalism. Only a tiny fraction of sects expand beyond the original cohort recruited by the initial innovator. The famous celibate Shakers are an example of a sect that failed to recruit followers, but there have been many others. A much smaller number are successful and have grown to become major religious institutions, largely replacing traditional denominations. The Methodists and the Mormons are examples of very successful sects that became major denominations.

Religious innovators build in small steps. Mormon theology is very different from that of most of American Protestantism. Nevertheless, historian John Brooke shows how founder Joseph Smith's cosmology mixes frontier Protestantism with hermetic ideas, Masonry, divination schemes for finding treasure, and spiritual wifery (polygamy).⁶³ He traces the spread of these ideas from Europe to specific families in Vermont and New York, where Smith and his family resided. Smith invented little and borrowed much, although we properly credit him with being a great religious innovator. His innovations were, like Harrison's, large compared to those introduced by most ambitious preachers.

Individuals are smart, but most of the cultural artifacts that we use, the social institutions that shape our lives, the languages that we speak, and so on are far too complex for even the most gifted innovator to create from scratch. Religious innovations are a lot like mutations, and successful religions are adapted in sophisticated ways beyond the ken of individual innovators. The small frequency of successful innovations suggests that most innovations degrade the adaptation of a religious tradition, and only a

lucky few improve it. We don't mean to say that complex cultural institutions can't ever be improved by the application of rational thought. Human innovations are not *completely* blind, and if we understood cultural evolutionary processes better they would be less blind. But human cultural institutions are very complex and rarely have been improved in large steps by individual innovators.

It would be instructive to analyze a sample of complex bits of culture, like a fifteenth-century ship, and estimate the minimum number of innovations involved in their manufacture and the spatio-temporal distribution of the component innovations. For most, the number is surely very large, and the times and distances that separate the components great. The same technique could be applied to religions, artistic endeavors, and social institutions. The qualitative impression imparted by the few historians who have paid attention to the large-scale patterns of cultural evolution is that the compass is a good exemplar. Many people spread over a wide area and prolonged period contribute to human adaptations. True, a given musical composition, ship, or watch does have an individual designer, but if the work is at all complex, the designer taps a rich tradition of design in addition to whatever element of creativity he or she can muster.

Biologist Jared Diamond describes a major macroevolutionary pattern that is consistent with the hypothesis that culture evolves gradually by many small steps.⁶⁴ Europeans were strikingly successful at conquering and dominating the Americas, Australia, New Zealand, and many other smaller islands after the voyages of discovery. In contrast, though Europeans dominated and colonized Asia, the degree of domination was much less complete and much less enduring. China successfully resisted colonization, and India and Muslim Central Asia have shaken off the Europeans. On the other hand, the European possession of the Americas, New Zealand, and Australia is permanent. What is the secret of Eurasian success? Diamond argues that the greater size of the Eurasian continent, coupled with its east–west orientation, meant that it had more total innovations per unit of time than smaller land masses, and that these innovations could easily spread throughout long east–west bands of ecologically similar territory. The Americas are not only smaller but are oriented north–south, making it difficult to diffuse useful cultivars, like maize from (say) temperate North America to temperate South America, or domesticated animals like llamas in the opposite direction. As a result, the set of adaptations necessary to support complex urbanized societies was assembled more slowly in the Americas.

The magnitude of human variation is explained by culture

In this chapter we have focused on what biologists would call the *proximate* causes of human variation—that is, we have been talking about its immediate causes rather than its long-run evolutionary causes. If you came to this chapter doubting the proximal role of culture in human behavior, we hope that we have convinced you that many of the differences between people are cultural—people are different, at least in part, because they acquired different beliefs, attitudes, and values from others.

For those who came to the chapter already convinced of the importance of culture, our message is *almost* the opposite. We hope to have shaken your faith that the role of culture is truly well described. There are very few well-designed studies that critically address competing hypotheses about the source of human behavioral variation. Edgerton's pioneering study of the relative roles of environment and cultural history is unique. Reasonably well-controlled studies of change and persistence in immigrant communities are few. We are aware that some—perhaps all—of the studies we have cited here have skeptics and critics. In the end, the only way to finally silence the doubters of the role of culture is to multiply the number of good studies until we can chart the proximal roles of genes, culture, and environment in explaining human behavioral variation with real quantitative precision. Frankly, we think that the defenders of culture have grown complacent and lazy. Secure in the moral conviction that only people with evil intentions subscribe to racist notions like genetic explanations for human behavioral differences, or capitalist ones like rational choice, anthropologists, sociologists, and historians have neglected their knitting.

As it is, we think that even the most cautious, fair-minded reader will be sufficiently persuaded by the evidence to at least admit that the hypothesis that most behavioral variation between human groups is the product of culture is persuasive and worth pursuing. Such readers should be able to admit to any amount of skepticism concerning details and the significance of particular studies without being called names by defenders of cultural explanations. As proponents of strong cultural hypotheses, we have pushed the evidence about as hard as we believe it warrants. Students of culture owe their own subject, if not their critics, the hard work needed to get it right.

Understanding the ultimate causes of human variation is also important, particularly because humans are much more variable than any other species of animal. Other animals do vary. Consider baboons as an example.

Many biologists classify most baboons in a single species, *Papio cynocephalus*. These animals occupy a range that includes many different habitats: hot lowland forest, cool highland forest, savannah, scrub, and true desert. Within this range, baboons vary physically, especially in size and color. All baboons feed mainly on plant materials, and supplement their diet with insects, eggs, and small animal prey. However, across their range, the exact composition of their diets varies. The baboons in Amboseli, Kenya, dig up grass corms and crack open acacia pods, while the baboons of the Okavango delta eat figs and water-lily bulbs. Most savanna baboons live in multimale, multifemale groups of about thirty to seventy individuals. Females remain in these groups throughout their lives. However, in the highlands of southern Africa, baboons form much smaller, one-male groups, and females sometimes disperse between groups; in the forests of West Africa, baboons aggregate in enormous hordes that may number several hundred individuals. Social behavior also varies to some extent. In East Africa, males form coalitions with other males to compete for access to receptive females; these kinds of coalitions are never seen in southern Africa.

Now compare the amount of human variation that we see among people who occupy the same range of African environments. Like baboons, humans vary physically, mainly in size and color. Unlike baboons, the people in these regions get their daily bread and organize their social lives in very different ways. Until about ten thousand years ago, all people were foragers who lived by gathering plants and hunting mammals. However, even among hunter-gatherers there was great variation. !Kung bushmen have a simple system of kinship in which male and female relations are treated the same, while their neighbors, the !Xo, who live a few hundred miles to the south, have an elaborate system of clans based on relationship through the male line. The !Kung and the !Xo both hunt the game of the Kalahari with small bows, while the Kxoe bushmen live mainly by fishing in the nearby swamps of the Okavango. Some pygmies of the central African forest rely on large-scale cooperative hunting using nets, while the Hadza of the East African savannah hunt big game with great bows.

Of course, today most people in Africa are not hunter-gatherers. There are nomadic pastoralists like the Maasai of East Africa who live on the products of their cattle, moving from place to place in search of good grazing. Maasai political organization is based on cooperation and loyalty among age sets, groups of men who were circumcised the same time. Among other nomadic pastoralists loyalties are based on kinship—male kinship in the case of the Somalis and female kinship for the Himba of Namibia. Farming

peoples grow a wide range of crops: millet and sorghum in the seasonally parched Sahel, peanuts, maize, and cassava in the forests of the Congo. They exhibit an equally wide range of social and political organizations: small family groups without any ranks or offices, elaborate kin-based clans, and great cities with full-time soldiers, priests, and rulers.

The behavioral variation within human groups is also much greater than the behavioral variation within groups of other animals. Again compare humans with baboons. The baboons living in a group do vary in their behavior. Male baboons are more likely to hunt than females; dominant females eat more of the most preferred foods, have the safest sleeping sites, and are harassed less than subordinate females; juveniles play more than adults; some females are more sociable than others; and so on. But all baboons must find their own food, keep a lookout for predators, and take care of their own infants. By comparison, even hunter-gather societies have part-time specialists in tool production, ritual activity, and food gathering. In complex farming societies the amount of variation explodes—there are butchers, bakers, candlestick makers, serfs, soldiers, sheriffs, kings, and clergy, who all have different knowledge, behavior, obligations, and subsistence tasks.

The difference between the range of human variation and that of other animals like baboons demands an evolutionary explanation. Ten million years ago (or thereabouts), our ancestors were an apelike species living in the forests and (perhaps) the savannahs of Africa whose range of variation was comparable with that of present-day baboons. Over the next ten million years, the processes of Darwinian evolution transformed that lineage into modern humans. Any theory that hopes to explain the behavior of contemporary humans *must* tell us what it is that causes humans to be so much more variable than any other species and why this peculiar capacity for variation was favored by natural selection. This burden falls particularly hard on models that try to account for human behavior invoking only individual learning mechanisms that also apply to other animals.

We think that the answer to the ultimate question about the magnitude of human variation is the same as the answer to the proximate question about its causes—culture. Our plan for the succeeding chapters is to assume that culture exists and ask if we can use this assumption to explain human peculiarities. In chapter 3 we begin by trying to explain why culture causes humans to be so variable, and in chapter 4 why culture was favored by natural selection.