Minds Make Societies

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How Cognition Explains the World Humans Create

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Introduction

Human Societies through the Lens of Nature

WHY SHOULD SOCIETY BE A MYSTERY? There is no good reason human societies should not be described and explained with the same precision and success as the rest of nature. And there is every reason to hope that we can understand social processes, as their impact on our lives is so great. Since there is no better way than science to understand the world, surely a science of what happens in human societies is devoutly to be wished.

But until recently we had nothing of the kind. This was not for lack of effort. For centuries, students of societies had collected relevant facts about different societies. They had tried to compare places and times and make sense of it all, often desultorily groping for principles of society or history that would emulate the clarity of natural laws. In many cases this effort proved fascinating and illuminating, from Ibn Khaldun and Montesquieu to Tocqueville, Adam Smith, and Max Weber—and many others. But there was little sense of cumulative progress.

All this is changing, mostly because evolutionary biology, genetics, psychology, economics, and other fields are converging to propose a unified understanding of human behavior. Over the past few decades, a variety of scientific fields have made great progress in explaining some crucial parts of what makes humans special—in particular, how humans build and organize societies. The main reason for this progress was a radical shift from tradition. The social sciences, at some point in their history, had made the disastrous mistake of considering human psychology and evolution of no importance. The idea was that understanding history and society would not

require much knowledge of how humans evolved and how their organs function. In that view, the natural sciences could tell you many things of great interest about humans, about the reasons we have lungs and hearts, about the way we digest or reproduce—but they could never explain why people would storm the Winter Palace or throw chests of tea into Boston Harbor.

But that was all wrong. As it happens, findings from evolutionary biology and psychology as well as other empirical sciences are crucial to explaining such events, and social processes in general. In the past fifty years or so, the scientific study of humankind has made great strides, producing ever-greater knowledge of how brains work and how evolution shaped organisms, as well as formal models of how people interact and how such local interactions give rise to global dynamics.

That we would progress toward this more unified perspective on human societies was anticipated for some time.[1] But it is only recently that the study of how people form and manage groups has been turning into a proper scientific enterprise, with many difficult questions and frustrating uncertainties—but also surprisingly clear results.

What Sort of Things Do We Want Explained?

One should never start with theory. Instead of first principles and deductions, let me offer a collage—a ragtag, fragmentary, and unorganized list of phenomena we would want a proper social science to explain.

WHY DO PEOPLE BELIEVE SO MANY THINGS THAT AIN'T SO?

All over the world, a great many people seem to believe things that others judge clearly absurd. The repertoire of what counts as reasonable in one place, and utter nonsense in another, is vast. Some people fear that contact with outsiders will make their penis disappear, while others hope that reciting a formula can make a stranger fall in love with them. People transmit to each other all kinds of rumors and urban legends. Some say that the AIDS epidemic was engineered by the secret services. Others maintain that the

machinations of witches are certainly the explanation for illness and misfortune. It would seem that human minds are exceedingly vulnerable to low-quality information—and that scientific or technical progress seems to make little difference.

WHY POLITICAL DOMINATION?

Man, some have said, is born free yet everywhere is in chains. Why do human beings tolerate domination? Social scientists, it seems, should try to explain to us how political domination can emerge and subsist in human groups. They should explain people's submission to autocratic emperors for most of Chinese history, their enthusiasm for nationalistic demagoguery in twentieth-century Europe, their cowed acceptance of totalitarian communist regimes for seventy years, or their toleration of kleptocratic dictators in many parts of contemporary Africa. If it is true that the history of most hitherto existing society is the history of domination by kings, warlords, and elites, what makes such oppression possible, and durable?

WHY ARE PEOPLE SO INTERESTED IN ETHNIC IDENTITY?

All over the world, and for as long as records exist, people have considered themselves members of groups, most often of ethnic groups, that is, of supposedly common descent. People readily construe the world as a zero-sum game between their own and other ethnic groups, which justifies all manner of segregation and discrimination, and easily leads to ethnic strife or even warfare. Why do people find such ideas compelling and seem prepared to incur large costs in the pursuit of ethnic rivalry?

WHAT MAKES MEN AND WOMEN DIFFERENT?

In all human societies there are distinct gender roles, that is, common expectations about the way women and men typically behave. Where do these come from? How do they relate to differences in anatomy and physiology?

Also, if there are distinct gender roles, why are they so often associated with differences in influence and power?

ARE THERE DIFFERENT POSSIBLE MODELS OF THE FAMILY?

Related to gender roles, there are considerable debates in modern societies about the proper or natural form of the family. Is there such a thing? Children require parents, but how many and which ones, and in what arrangements? These discussions are often conducted in terms of ideology rather than appeal to scientific facts. But what are the scientific facts about the diversity and common features of human families? Do these facts tell us what forms of the family are more viable, or what problems beset them?

WHY ARE HUMANS SO UNCOOPERATIVE?

Humans spend a great deal of energy in conflict, between individuals and between groups. The frequency and nature of conflicts, and the extent to which they lead to violence, vary a lot between places. What explains such differences? Also, is human conflict an inevitable consequence of our nature? For instance, people used to think that there was some aggressive urge in humans that needed to be released, a bit like pressure building up inside a furnace until the steam escapes through a safety valve. Is that a plausible description of human motivations? If not, what explains violence and aggression?

WHY ARE HUMANS SO COOPERATIVE?

The obverse of conflict is cooperation, which attracts less attention, probably because it is ubiquitous and therefore invisible. Humans are extraordinarily cooperative. They routinely engage in collective action, in which people coordinate their actions to get better results than they would in isolation. People in small-scale societies go hunting or gathering food together, and they often share most of the proceeds. In modern societies they join

associations or political parties to achieve particular goals. Is there a cooperative instinct in human beings? If so, what conditions favor or hinder its expression?

COULD SOCIETY BE JUST?

In most human societies there are class or rank distinctions, and production results in unequal incomes and wealth. In some cases the difference seems a simple effect of political dominance. Warlords, aristocrats, dictators, or the nomenklatura of communist regimes simply appropriate the best resources. But in most modern democracies the economic process leads to unequal outcomes without such direct theft. The main question of modern politics is, What to do with such outcomes? But this question itself raises many others that our social scientists should be able to answer, for example, What do people mean when they say they want a just society? Why does that goal motivate people to advocate diametrically opposite policies? Is there a common human notion of justice, or does it differ from place to place? Can humans actually understand the complex processes that lead to unjust or unequal outcomes?

WHAT EXPLAINS MORALITY?

Why do we have moral feelings and strong emotional reactions to violations of moral norms? People the world over have moral norms and pass moral judgment, but do they do so on the basis of the same values? And how does morality enter the minds of young children? Many moralists described human nature as entirely amoral, suggesting that ethical feelings and motivations were somehow planted in our minds by "society." But how would that happen?

WHY ARE THERE RELIGIONS?

There are organized religions in many places in the world. In small-scale societies there are no religious organizations, but people talk about spirits and ancestors. So it seems that humans have a general susceptibility to such

notions. Is there a religious instinct, some specific part of the mind that creates these ideas about supernatural powers and agents, those gods and spirits? Or, on the contrary, do these religious representations illustrate some possible dysfunction of the mind? In either case, how do we explain that religious activities include collective events? How do we explain that humans seem to entertain such an extraordinary variety of religious ideas?

WHY DO PEOPLE MONITOR AND REGIMENT OTHER PEOPLE'S BEHAVIORS?

The world over, people seem to be greatly interested in moralizing, regulating, and generally monitoring other people's behaviors. This is of course very much the case in small-scale groups, where one lives under the tyranny of the cousins, as some anthropologists described it. But in large, modern societies, we also see that people are greatly interested in others' mores, sexual preferences, the way they marry or what drugs they take. This certainly goes beyond self-interest and raises the question, Is it part of human nature to meddle?

There is no particular order in this disparate list, and no coherence either—some of these are very broad questions, and others much more specific. Some are questions that many philosophers and writers have labored on over centuries, others only occur if you know human prehistory. People from another time or another place would certainly ask different questions, or would formulate them very differently. The point here is to suggest the kind of questions that we expect social scientists to address.

These questions are at the center of many contemporary debates throughout the modern world, about, for example, the role of ethnic identity in making nations, the effects of economic systems on social justice, possible models of the family and gender relations, the dangers posed by extremist religions, or the consequences of what is often called the information revolution. Because these are pressing and important questions, there

is of course a great demand for easy, sweeping answers that would both describe and prescribe, tell us how society works and by the same token how to make it better. Many political ideologies are based on that kind of promise of a magic bullet that answers most issues and provides a guide for action as well, a solution that is neat, plausible, and wrong, as H. L. Mencken put it.

But we can do better. In particular, we can step back and ask, What do we actually know about the human dispositions, capacities, or preferences involved in all these behaviors? One may be surprised by how much we already know about, for example, the way a human mind acquires beliefs and evaluates their plausibility, how humans become attached to their groups or tribes and conceive of other groups, what motivations are involved in building and maintaining families, or about the processes that make women and men so different and similar.[2]

Rule I: See the Strangeness of the Familiar

Springboks sometimes jump up in the air with great élan (they "stot" or "pronk") when they detect a lion, an apparently self-defeating course of action, as it makes them far more noticeable to the lurking predator. Peacocks sport a large and apparently useless train of beautiful long feathers. Such traits and behaviors appear surprising enough. It seems to us that gazelles should know better than to attract a predator's attention, and that peacocks are just wasting energy carrying around such heavy pageantry.

An extraterrestrial anthropologist might well feel, and a proper social scientist should certainly feel, equally baffled by many aspects of human behavior. Why do humans form stable groups, in competition and occasional conflict with other groups? Why do they show any attachment to their groups, sometimes at the expense of their own welfare? Why do they imagine deities and engage in religious ceremonies? Why do men and women form stable unions and jointly nurture their children? Why are people apparently concerned with justice and inequality? And so forth.

Cultural anthropologists used to encourage their students to investigate the norms and practices of people in distant places, on the sensible

assumption that familiarity is one of the biggest obstacles on the way to understanding social phenomena. Sacrificing a bull to placate invisible ancestors seems very sensible to many East African pastoralists. Having an entire organization, with specialized personnel and buildings, dedicated to managing relationships with invisible deities seems just as reasonable to many Christians or Muslims. Only unfamiliar customs prompt us to seek explanations. It was a French aristocrat, after all, who wrote the best description of the early American republic. Tocqueville was familiar with Ancien Régime absolutism and the revolutionary Terror—which is precisely why he could see American democracy as a perplexing oddity, in need of an explanation.

Understanding very general features of human cultures, like the existence of marriage or religious beliefs or moral feelings, requires the same estrangement procedure. Only this time we must step aside, not just from local norms, but from humanity itself. How could we do that? The economist Paul Seabright suggested that we should consider human behavior from the viewpoint of other animals. If bonobos, for instance, studied humans, they would marvel at the way we spend an inordinate amount of time and energy thinking about sex, longing for it, imagining it, singing, talking, and writing about it, while actually doing it so very rarely—rarely, that is, compared to bonobos. Gorillas would be astonished that the leader in human groups is not always the most formidable individual, and puzzle over the question of how weaklings manage to exert authority over the big bruisers. A chimpanzee anthropologist would wonder how humans can huddle together in large crowds without constant fights, why they often remain attached to the same sexual partner for years, and why fathers are at all interested in their offspring.[3]

Fortunately, we do not need to adopt a gorilla's or a chimpanzee's viewpoint. We can look at human behaviors from the outside, because evolutionary biology allows us to do so. In fact it requires us to do so and, together with other scientific disciplines, provides the necessary tools. The evolutionary perspective assumes that we inherited specific human capacities and dispositions, different from those of other organisms, because they contributed to the fitness, the reproductive potential, of our ancestors. Seen

from that evolutionary standpoint, all human cultures do seem exceedingly strange, all customs seem to cry out for explanation. Most of what humans do, like form groups and have marriages and pay attention to their offspring and imagine supernatural beings, becomes slightly mysterious. It could have been otherwise. And in most animal species it certainly is. As the anthropologist Rob Foley put it, only evolution can explain those many ways in which we are just another unique species.[4]

The evolutionary perspective also allows us to go past all the easy, shot-from-the-hip answers that crop up all too often in our spontaneous reflections about human behaviors, for example, Why do people want to have sex? Because it is pleasurable. Why do humans crave sugar and fat? Because they taste good. Why do we abhor vomit? Because it smells terrible. Why do most people seek the company of funny people? Because laughing is pleasant. Why are people often xenophobic? Because they prefer their own ways and customs to those of others.

In evolutionary terms, these explanations of course have it back to front. We do not like sugar because it tastes good and abhor vomit because it is foul smelling. Rather, one is delicious and the other repulsive because we were designed to seek the former and avoid the latter. We evolved in environments in which sugar was rare enough that taking all you could was a good strategy, and vomit was certainly full of toxins and pathogens. Individuals who showed these preferences, a bit more than others, would extract more calories and fewer dangerous substances from their environments. On average, these individuals would have an ever so slightly better chance of having offspring than those others. In more accurate terms—some genes provided organisms with a moderate interest in ripe fruit, while other variants prompted a keener motivation to eat them and greater pleasure in their consumption. The latter genes gradually became more frequent in human populations. That is all we mean when we say that a strong craving for sugar is an evolved property of today's humans, and the same goes for the avoidance of regurgitated food. This evolutionary logic, so easy to understand and even easier to misunderstand, is a key to explaining human behaviors, including the way we live in societies.

Fine, one might think, our evolved nature could explain the fact that we live in societies, but could it explain the different ways we live, in different societies with different norms? After all, the questions I listed above are all about processes that differ from place to place. Family relations are different in Iceland, Japan, and the Congo. The way we commonly frame social justice issues is certainly different in modern mass societies, agrarian kingdoms, and small groups of foragers. Religious doctrines and beliefs in magic also seem very different in different places. So, could a study of human evolved nature, presumably the same in all these places, explain such diverse outcomes?

To answer this question would (and in fact does) take a whole book. But the main answer is that, yes, our evolved capacities and dispositions do explain the way we live in societies, and many important differences between times and places. But we cannot, and should not try to, demonstrate that in theoretical terms. Rather, we can examine some important domains, like the form of human families and the existence of political dominance, and see how they make much more sense once we know more about the human dispositions involved.

GETTING INFORMATION FROM ENVIRONMENTS

Let us step back. To understand the logic of evolutionary explanations, including the explanation of complex social behaviors, we must describe the way organisms in general pick up information from environments. Rather than laboring the point in theoretical terms, it may be more help to start with an example.

In many species of birds, reproduction follows the seasons. Beginning in spring, males and females size each other up, select an attractive partner, build a nest, mate, and are blessed with a few eggs that promptly hatch. The parents feed their offspring for several weeks, after which they all part. At the beginning of autumn, the cycle could in principle start again, but the birds now seem to have lost the appetite for sex and parenting. This makes sense, as food is most abundant precisely when needed to feed the offspring. In migratory species, late summer and early autumn is also a time when individuals regrow feathers and build up muscle mass in preparation

for long journeys. So they need to sustain themselves rather than bring worms to hungry squawkers. In many species the sex organs shrink during that season.[5]

This yearly schedule of reproduction constitutes an adaptation to the ecology of middle and high latitudes of Eurasia and the Americas. The environment simply could not support more than one clutch a year; the time required for courtship, nest building, mating, and feeding offspring demands that one start early in spring. Once-a-year reproduction is optimal, given these conditions. It is an evolved property of these organisms, what we would call a part of their evolutionary inheritance.

But what about their genes? As far as zoologists know, there is nothing in their genome that would compel the birds to reproduce only once a year. There is no mechanism to stop then from reproducing shortly after having successfully brought up their young. The once-a-year cycle is triggered by a much simpler, genetically informed system that prompts hormonal changes resulting in an interest in reproduction only when the length of daylight passes a specific threshold. As days get longer in spring, this system triggers the cascade of behaviors that result in reproduction.

So an evolved trait (reproducing only once a year in high latitudes) depends on two distinct pieces of information. Inside the organism, there is a genetically controlled clock with a hormonal trigger (days longer than a certain time *d* prompt reproductive behaviors). Outside the organism, another piece of information is the fact that days of length *d* occur twice a year, as a consequence of the motion of the sun on the ecliptic plane. Naturally, these two pieces of information can mesh together and produce a specific behavior because of other physical facts, like the fact that reproduction takes more than *x* weeks from start to finish, and *x* is longer than the interval between two days of length *d*. The important point here is that you can get an evolved trait or behavior of organisms without genes that specify that trait or behavior. To the extent that stable properties of environments supply the additional information required, natural selection never had to supply it through genes.

It may seem that there is a great distance between thrushes and warblers detecting that the time is ripe for sex and complex human behaviors

like building political systems and learning technology. Indeed, it is a great distance, because humans acquire vastly more information, of more diverse kinds, from their environments than other organisms, and because they acquire most of it from other humans. But the principles of information apply to the complex case as they do to the simple one. Information consists of detectable states of the external world that reduce uncertainty in the internal states of the organism. The process requires a set of possible internal states, organized in such a way that they be modified in predictable ways by the information received.[6] Genes and the complex structures that they help build obey the same principles in interacting with environments.

Rule II: Information Requires Evolved Detection

So far, so simple. But the interaction of genes with environments has some unintuitive consequences. One of them is that there is no such thing as the environment—there are only particular environments from the standpoint of organisms with particular genes. The fact that day length passes a particular threshold, at some point in spring, may have important consequences in some birds' brains. But it leaves most other organisms completely indifferent. Dung beetles carry on eating and digesting dung with the same enthusiasm, entirely oblivious to what quails and warblers find so important. And that is not because beetles are less complex organisms than birds. Often the apparently simpler animal detects what more complex ones ignore. For instance, salmon and eels can detect subtle changes in the amount of salt dissolved in the surrounding water—these are parts of the environment for those fish, and a crucial piece of information for organisms that migrate between fresh and salt waters—but such changes are not detected by supposedly complex organisms like ducks, otters, or human swimmers.[7] Similarly, closer to our everyday experience, an extraordinary variety of delicately different smells constitute the environment of a dog, yet they are all but undetectable to the more complex human brain. It is an evolved feature of salmon and eels that they detect currents and salinity, and infer the direction they should take. It is through genetic selection that some birds became sensitive to daylight duration or to Earth's magnetic field. It is also

because of their specific genomes that bees and birds can detect light polarization that is blithely ignored by most mammals. Again, information from the environment affects only organisms whose genes produced the right equipment to detect that particular kind of information.

But we have great difficulty in applying this straightforward principle to human organisms. We routinely accept that humans extract all kinds of information from their environment but fail to see that this is only possible because of specialized information-detection equipment. So let me use another example. An aspect of our environment that is packed with relevant information is the direction of people's gaze. In physical terms, the relative sizes of those two fragments of the white sclera, on both sides of the iris, that are visible when we open our eyes can be used to infer a direction of gaze, which is itself used to select the object a human being is attending to. It is clear even to infants that this is an important piece of information, which commands their attention and can reveal to them what someone is paying attention to, that is, a person's invisible mental states.[8] Extracting information from the environment requires knowledge, because, strictly speaking, that information consists of cues (the two white areas of the eye) that trigger specific inferences (an estimate of the ratio of the right/left sclera area), which in turn leads, via some subtle trigonometry, to the computation of a specific direction of gaze, which itself supports a representation or a mental state, for example, "she's looking at the cat"). This rather complex computation requires not just the geometric competence but also a host of prior, very specific expectations. That is, the system cannot compute what you are looking at without assuming, among other things, that there is indeed such a continuous line between eyes and objects, that it is always a straight line, that it does not go through solid objects, that attention usually focuses on whole objects, not parts of objects, that the first object on that line probably is the one attended to, and so forth.[9] These are all pretty subtle and complicated assumptions, but they are required to do something apparently as simple as detecting where someone is looking.

And the subtlety does not stop there. Knowing where someone is looking also tells you about that person's mental states. If there are four different cookies on the table, and the child has her eyes intently fixed on one

of them, which one do you think she really wants? Which one will she pick up? This kind of guessing game is trivially easy for most of us. But some autistic children have a hard time with that question, to which they give random answers. They can tell you which one the child is looking at—no problem there. They also know what it is to want something. But the link between looking at the brownie and wanting the brownie is often opaque to them.[10] It takes a special pathology to alert us to this fact—the connection between direction of gaze and intentions is a piece of information that we must add to our understanding of the scene. That the child prefers the brownie is information only if you have, again, the right kind of detection system.

What detection systems an organism possesses is of course a consequence of evolution. Humans constantly use gaze detection to infer each other's mental states, an immensely useful capacity in a species where individuals depend on constant interaction with others for their survival. Being able to infer what other people are looking at is a great advantage when you need to coordinate your behavior with them. If you see gaze detection in this evolutionary perspective, you could also predict that domesticated animals, to the extent that they interacted with humans, might be able to detect human gaze too. That is indeed the case for dogs, whose domestication included complex interaction with humans for protection and then hunting, two activities in which some minimal understanding of human intentions was an advantage. By contrast, chimpanzees can detect gaze in humans only after an excruciatingly long training, and even then their performance is not great—because their evolutionary history did not include such joint attention interaction with humans. That is also why domestic cats, which do not engage in cooperative tasks with humans, are generally clueless in that respect.[11]

To repeat, then, information is there only if you have the right detection system—and you have the detection system because having it, or a slightly better version of it, proved advantageous to your forebears, over many generations. But here's the catch. Precisely because we have these detection systems, and they work smoothly, without us being aware of their operation, their existence is well nigh invisible to us. It seems to us, when

we reflect on the way we manage to understand the world around us, that the information really is there for the picking, just waiting to be noticed, as it were.

This way of thinking, where we know about the information detected but fail to remember that it requires a detector, is called spontaneous or naive realism. It is our natural way of thinking about the way our minds acquire information, as if information were waiting for organisms to pick it up.[12] Spontaneous realism is difficult to abandon when it comes to complex social phenomena like detecting prestige or beauty or power. But even power is an abstract quality that is all but invisible to those without the right cognitive equipment. It may seem that it is not very difficult to understand who is in power in a human group—after all, some people seem to boss others around, so how could one not see that? But thinking that way is falling into the spontaneous realism trap. People's behaviors can be seen as instances of "bossing" and "obeying" only for a detection system that pays attention to behaviors as expressing preferences, that can attach specific preferences to different individuals, that can recall the relevant parts of individuals' behaviors, and that presupposes much more, for instance, the notion that rank is transitive, so that if *a* is superior to *b* and *b* to *c,* then *a* is above *c.* Young children already have some intuitions about the behaviors that make dominance manifest, long before they have much knowledge of their implications in human life.[13] So, to repeat something that does need a lot of repetition, there is no information picked up from environments without the right kind of detection equipment. Fortunately, we are now making great progress in understanding the specialized systems that help humans acquire information from their social environments, even for subtle differences in power or prestige or beauty.

LEARNING HOW TO BABBLE, BE GOOD, AND MENSTRUATE

Another consequence of information detection is that the more information organisms pick up from their environments, the more complex their detection systems will need to be. Moving along a continuum of complexity, from

rather simple protozoans to cockroaches to rats to humans, we find organisms that acquire more and more information from their surroundings. But the capacities of these organisms also become vastly more complex, from amoebas to rats to humans. Acquiring more information from environments requires more information in the system. In fact, it is a good rule of thumb of cognitive evolution that organisms that learn more are the ones that know more to start with. (This should be unsurprising to computer users above a certain age, who can compare systems they use nowadays to those available twenty years ago, now-vintage computers that could "learn" much less—that is, receive and process much less information, of fewer different types, from the digital environment—because they had less prior information, that is, less complicated operating systems than more recent machines.)

More complex organisms can engage in more learning than simpler ones. Learning is the general and very vague label that we use to describe a situation in which an organism acquires some external information, which modifies its internal states, which in turn modifies its subsequent searches for information. A great deal of learning is involved in most humans' behaviors. Here are a few examples of how learning unfolds in young minds.

BABBLING

From birth (and indeed some time before that) infants spontaneously pay special attention to speech, as opposed to other sounds, and can recognize the typical rhythm and prosody of their mother's language, perceived in a rather muffled form during the last months of gestation. In the first months of life, this leads them to pay attention only to recurrent sounds that are pertinent in their language and to ignore everything else as noise. That selective attention is reflected in babbling, which starts as a wonderfully catholic mixture of all possible sounds one can make with vocal cords, a mouth, and a tongue, and gradually restricts itself to the sounds of the local language.[14] Paying attention only to specific sounds in turn allows infants to identify the boundaries between words, a pretty difficult thing to do, as the

stream of speech is generally continuous.[15] So learning takes place in steps—isolate language from the rest, isolate features of your language, isolate relevant sounds from noise, isolate words from each other. Each step, obviously, requires some previous expectations—for example, that there is such a thing as speech, that it matters more than other sounds, that there are two kinds of recurrent units, sounds, and words, and so on.[16] At each point these expectations allow the organism to orient to a special aspect of the sonic environment, and at each step these expectations are in turn modified by the kind of information that was picked up. These expectations make children attend to some properties of speech as carrying meaning but not others—they expect that the recurrent difference between ship and sheep, or between chip and cheap, may carry some difference in meaning, but they ignore the difference in the word "ship" pronounced by a man and a woman—even though the acoustic contrast is just as great. Children can acquire their native language, from interaction with other speakers, because some very specific mental systems are prepared to attend to specific properties of sounds.

BEING GOOD . . .

Children also learn about invisible things—morality is a good example. The difference between moral and immoral behaviors does not reside in any properties of the behaviors themselves. Given special circumstances, giving away your money might be criminal, and beating people may be commendable. As the moral value of actions cannot be observed, human minds have to "paint" moral qualities on behavior. How does a developing mind learn to do that in the appropriate way?

A tempting explanation would be that children observe and experience the negative rewards that accompany disapproved behaviors, in the form of punishment, and then generalize some kind of negative quality to many other behaviors. But that is not as simple as it seems. First, even infants are sensitive to antisocial behavior. They dislike puppets that clearly try to hinder or harm other puppets—and that is long before they can experience disapproval or punishment.[17] And if children actually tried to

generalize from what they are told is wrong, how would they do it? Children from an early age can attend to the kinds of actions that others around them, adults in particular, seem to condone or condemn. But adult reactions are no help if you have no understanding of their underlying reasons. People tell you that it was quite wrong to attack an old lady in a dark alley and steal from her purse. Fine, but how do you conclude that it is also wrong to shortchange a blind person? One might think that this is not hard—all you have to do is to notice that, in both cases, someone used unequal strength or another advantage to exploit a vulnerable individual. But to produce that generalization, the developing child has to mobilize, at least in an implicit way, abstract notions, such as freedom versus coercion, exchange versus exploitation. To some extent, that is exactly what children do—their early intuitive understanding of cooperation and fairness helps them make sense of otherwise unpredictable moral judgments.

There is in the mind a moral learning system, a detector for morally relevant information in the environment. That much is made obvious by the fact that some people lack it. Psychopaths are those people who actually develop in the way predicted by the commonsense theory, that we could learn morality by generalizing punishment, that is, understand moral values only in terms of what rewards they bring. Individuals of that kind do realize that a range of behaviors lead to punishment, which is against their interests. They conclude from these facts that they must manage to get the benefits of whatever they want to do, while avoiding the unpleasant consequences.[18] They survive, and sometimes thrive, by exploiting others and making sure they can get away with what others intuitively find repulsive and exploitative. This peculiar syndrome has of course attracted considerable attention, and there is now a large amount of evidence concerning the specific brain activation patterns, hormonal profiles, and modes of thought associated with that behavior.[19]

So the story of the child simply picking up moral understandings from the local culture, by observation and generalization, is terribly misleading. It seems plausible only if we do not bother to fill in the blanks in that description and specify exactly what information is picked up, how, and when, by what system.

. . . AND HAVING BABIES

Now ponder the question, How do young girls learn to menstruate? It may seem a strange question, but certain aspects of reproduction do involve some form of learning. Consider the prevalence of early teen pregnancy in some parts of the United States. This was and still is clearly associated with socioeconomic status and education. Poorer young women (in the lowest quartile of income) are much more likely than richer ones to become pregnant before the age of twenty. Many social programs tried to address what was seen as a pathology, or as the result of ignorance concerning the facts of life. But they had practically no effect, and were based on dubious assumptions anyway—in modern urban environments, young women do know how sex leads to reproduction.

So, if teen pregnancy is not just an aberration, why does it occur? Large-scale studies show that many circumstances contribute to the phenomenon. One major and rather surprising factor is that young women whose biological father was (for whatever reason) absent from the household during early and middle childhood are more likely to engage in early sexual activity, and also to become pregnant at an early age.[20] The separation of parents but also the timing of separation are strongly predictive of early menarche (first period), early sexual activity, and teen pregnancy.[21] These factors remain even if one controls for the effects of socioeconomic status, ethnicity, or other social factors. But what is the connection between father absence, long before the girl's puberty, and early sexual maturation? There is no evidence that it has anything to do with a lack of parental authority (fathers laying down the law) or economic status, or of local norms, that is, young girls just imitating what is done around them. None of these factors, in any case, would explain the link between father absence and the timing of a girl's first menstruation.

A more plausible explanation, that is still partly speculative, is in terms of learning. The fact that a growing girl has no father may provide her with an indication that, in her environment, fathers generally do not invest in their offspring. If durable investment from high-value males is unlikely, and if one's own prospects are also unlikely to improve, an efficient strategy

would be steeply to discount the future, increase the number of one's offspring, and have them as early as possible.[22] That is a strategy that is mostly open to very young women, at the peak of attractiveness in the eyes of such males. These factors would converge to favor an early reproduction strategy, whereby a woman produces more children earlier. This explanation makes sense of many other features of the phenomenon, like the fact that young women with no fathers express more interest in infants, even unrelated ones. This interpretation is of course not definitive, as we have to fill many gaps in the proposed causal chain—and it takes vast amounts of data to disentangle the effects of different variables. Also, it may be the case that some of the variance in such behaviors is driven by genetic differences, so that daughters tend to replicate their mother's reproductive strategies partly because they carry the same genes.[23]

Naturally, there is no need for conscious decision making here. Young women do not think in these quasi-evolutionary terms, assessing the men in the local mating market in terms of their potential costs and benefits. Rather, they respond to internal motivations and preferences, among which are sexual attraction, romantic love, a longing for children, and the satisfaction of having them. Unconscious processes attend to relevant information in the environment and favor one among the several reproductive strategies available to humans.[24]

INTUITIVE INFERENCE SYSTEMS

I mention these examples of learning to illustrate some properties of the mental systems that organize human behavior, by acquiring vast amounts of information from the environment, including of course from other individuals and what they do and say. Learning is made possible by a whole range of mental mechanisms that I call here intuitive inference systems (other common terms are "modules" and "domain-specific systems").[25] The "inference" part of the name just means that they handle information, and produce modified information, according to some rules. For instance, to turn sounds into meaning, we rely, first, on a system that receives a continuous stream of speech and turns it into a largely imagined stream of discrete

words with boundaries between them. Another system then identifies such abstract properties as word order, or prepositions, or case endings if you are listening to Russian, and other morphological information, and uses all this to parse the sentence, forming a new representation that specifies who did what to whom and how.

The human mind comprises a great number and a great variety of such systems, carrying out the most diverse computations, such as detecting people's line of gaze, assessing people's attractiveness, parsing sentences, telling friends from enemies, detecting the presence of pathogens, sorting animals into species and families, creating three-dimensional visual scenes, engaging in cooperative action, predicting the trajectory of solid objects, detecting social groups in our community, creating emotional bonds to one's offspring, understanding narratives, figuring out people's stable personality traits, estimating when violence is appropriate or counterproductive, thinking about absent people, learning what foods are safe, inferring dominance from social interactions—and many, many more. These constitute a rather disparate menagerie, but inference systems have some important properties in common.

First, these systems operate, for the most part, outside consciousness. We simply cannot be aware of the way we identify each word in speech, that is, retrieve it in less than a tenth of a second from a database of perhaps fifty thousand lexical items. In the same way, we do not know what exact computations take place somewhere in our minds, yielding the result that an individual is attractive or repulsive. We do not have to engage in deliberate reasoning to feel disgust at gross violations of our moral norms, like assaulting the weak and betraying one's friends. That is why we call these systems intuitive, meaning that they deliver some output, for example, the impression that a food is disgusting or that an individual is a dear friend, without us being aware of what computations led to that conclusion. All we can report is the conclusion itself—which of course we can then reason about, explicate, or justify. But the intuition did not need those reasonings.

Second, it is clear that the inference systems are specialized.[26] A mental system in young girls pays attention to the presence of a biological father,

and several years later may affect the timing of puberty as well as motivations for sex and motherhood. The processes involved are probably of no help at all to figure out the boundaries between words in language. And learning how your language handles verb conjugations has presumably little effect on your moral development. These different systems are relatively isolated from each other. This is an unsurprising consequence of the principle of no information without detection. A system can detect information only if it does not detect other events. There is so signal unless you ignore noise. But what is noise for some inferences—for example, the clothes you are wearing do not change the way we understand your sentences—can be signal for another, for example, to figure out your social class or ethnicity. So each system has to focus on particular kinds of information.[27]

This is of course familiar to us from the use of computer programs, which are unlike evolved minds in many ways but share this property of being composed of different subprograms with dedicated functions. The word counter in a word processor tells us how many words are in a text. The spell-checker tells us whether they are spelled in our text as they are in a stored lexicon. But the word counter does not notice spelling errors, nor does the spell-checker tell you about the length of a text. And neither of these systems can tell you whether the words you used are common or recherché. These are all what we call domain-specific computations, as each system performs a limited set of operations and no others, on some particular input and nothing else.

Third, we can much better understand the way these different systems work, what they pay attention to, and what behaviors they motivate once we see them as evolved properties of our species, that is, ways of acquiring information that promoted the fitness of individuals that had them in their repertoire. This suggests that the best way to understand cognitive architecture, the different components of the mind and their relations, is to see how the components match specific problems we humans encountered in our evolutionary past. This way of connecting evolution and mental systems was the starting point of the domain of research now known as evolutionary psychology.[28] In precise terms, variants of genes that promoted a slightly more efficient, or slightly less costly, version of these little systems (through

unfathomably complex cascades of gene activation, protein manufacture, gene switching, hormone release, and so forth) were slightly more likely to be replicated via reproduction. As will become clear in the chapters that follow, otherwise mysterious aspects of our mental functioning, and of its consequences for social life, can be illuminated by asking what contributions they could make to genetic fitness.

Seeing a mental inference system as an adaptation is only the starting point of a research program. This evolutionary hypothesis deserves consideration only if it allows us to predict new or nonobvious aspects of the inference system, and if we can test these predictions against observations or experimental evidence. As the systems are very diverse, so are these research programs. That is why we should not expect the new scientific convergence I describe here to yield a general theory of human societies. But it can produce something vastly more useful and plausible, a series of clear explanations for the many different properties of human minds involved in building human societies.

Rule III: Do Not Anthropomorphize Humans!

The poet and amateur naturalist Maurice Maeterlinck once described the tender emotions he could see on an ant's face as she regurgitated food on the colony's larvae, her eyes full of selfless maternal devotion.[29] He wisely stuck to his career as a poet and playwright. No student of ants, however admiring of their many qualities, would take that sort of description seriously. But it reflects a way of seeing nature that was (and is) not uncommon. Before we knew much about thunder and earthquakes, it seemed quite natural to think that some agents were behind these spectacular phenomena. But we learned to avoid this kind of explanation. The world is governed by physical laws, not by the intentions of agents. Trees grow and rivers flow, but not because they want to. As science gradually expanded our knowledge of the way the world actually works, anthropomorphism (seeing other species as human-like) and animism (seeing agents in such things as trees and rivers and thunderstorms) have been continuously receding from serious scholarship.

There is one domain, however, where this retreat from animism and anthropomorphism still meets considerable resistance, and that is human behavior. When we try to explain why people do what they do, our natural inclination is to see them as persons. That is, we assume that people's behavior is caused by their intentions, that people have access to these intentions, that they can express them. We also assume that people are units, that is, each individual has preferences, for example, for coffee over tea, so that it would be strange to ask what part of them has those preferences or how many subparts of them favor coffee. We treat people as whole and integrated persons. In other words, we anthropomorphize them.

That is just as wrong for a science of people as it was for the science of rivers and trees. Indeed, for centuries, being anthropomorphic about people has been the main obstacle to having a proper science of human behavior. The notions that people have definite reasons for behaving, that they know these reasons, that there is a control unit inside human minds that evaluates these reasons and governs behavior—all these assumptions are terribly misleading. They hinder proper research and should be abandoned.

There is of course nothing wrong in treating people as persons when we interact with them—quite the opposite. To construe others as unique agents with preferences, goals, thoughts, and desires is the basis for all moral understandings and norms. To see them as integrated, that is, with some centralized capacity for judgment that adjudicates between their possibly different goals and intentions, is also the only way to allocate blame and responsibility. It is a way of thinking that comes to us automatically and is indispensable for social interaction.

But not for science. That is, when it comes to understanding the actual causes of behavior, what we know of human minds and their neural underpinnings suggests that we should dispense with the notion of a centralized pilot, that an expressed preference for tea over coffee may involve dozens of mostly autonomous systems—in short, that we must do with minds what we routinely do with cars, look under the hood and figure out how distinct parts contribute to the general effect, so to speak. We have no difficulty understanding that this is the right approach as regards

hugely complicated systems like immune function or digestion. But it is much more difficult when it comes to thinking.

The problem is, we human beings think we already know how thinking works. For instance, we assume (without necessarily making it explicit) that thinking takes place in a central processor, where different thoughts, essentially similar to the ones we experience consciously, are evaluated and combined with emotions and give rise to intentions and plans for action. All human beings have what psychologists call a spontaneous "theory of mind" or intuitive psychology, a set of systems that makes sense of the behaviors of other agents in terms of their intentions and beliefs.[30] Intuitive psychology is automatically activated when we consider behavior. We see an individual walking, then stop for a short while, then turn back and rush in the opposite direction—and cannot but infer that she suddenly *remembered* something she had previously *forgotten* and that she now *wants* to *attend to* that previous goal. The terms in italics all describe invisible, internal states of the individual, which we spontaneously imagine whenever we consider behavior. We spontaneously attribute beliefs and intentions to organisms from other species, which sometimes works, in the sense of predicting behavior, and often does not. We also do it with complex machines, especially ones that handle information, like computers.

The problem is that our intuitive psychology is not a precise and accurate description of the mechanisms of thought. Perhaps a familiar example will be of help. We routinely anthropomorphize computers. We say for instance that the computer is trying to send some material to the printer, but it does not know what type of printer it is, or it has not yet realized yet that the printer is switched on. Such statements (roughly) make sense, as they describe a situation in terms that provide some indication of what has gone wrong and what could be done about it. But if we want to understand why, how, and when such computing incidents occur, we have to use a completely different vocabulary. Now we have to talk about physical ports, logical ports, serial protocols, network addresses, and so forth. The philosopher Daniel Dennett describes this shift in modes of explanation as the transition from an intentional stance—we describe the parties at hand in terms of beliefs and intentions—to a design stance, where we talk about components and their relations.[31]

Understanding how minds work requires a similar transition from intentional to design talk, which is sometimes rather unintuitive. For instance, nothing seems simpler than the notion of belief. Some people believe ghosts exist and others do not, some people believe they put their car keys in their pockets, others believe a guitar has six strings, and so forth. But in some circumstances, this talk of beliefs can lead us astray.

Consider, for instance, the way people can act on the basis of magical beliefs that they do not actually believe, so to speak. In many experiments, psychologists like Paul Rozin and his colleagues have demonstrated that many people are susceptible to magical thinking.[32] For example, given a choice between two glasses of water bearing the labels "water" and "cyanide," they would rather drink from the former, even if they saw the experimenter pour water in both glasses from the same pitcher. There are many other experimental conditions where people have such apparently magical thoughts, for instance, refusing to don a sweater described as part of Hitler's wardrobe. Most participants in these studies are quite clear that they do not believe in magical contagion. Yet their behavior often contradicts that statement. Does it mean that they somehow believe in magic without believing that they believe in it?

We are condemned to such contorted descriptions if we stick to our common, intentional description of the mind, which specifies that there is a central belief box, as it were, where the organism's current beliefs are stored and combined to produce new inferences. Then it really seems to be the case that, despite their protestations to the contrary, people in these situations actually believe in magical contagion—a label on a glass makes the contents dangerous, a murderous dictator makes his sweaters somehow poisonous.

But there is another way of looking at all this, from a design stance. The mind is composed of many inference systems, each specialized in a narrow domain of available information. From this perspective, what happens when people see a glass labeled "poison" is that the systems that handle threat detection are activated, because the label matches one of their input conditions—a cue indicating a substance dangerous to ingest. Other pieces of conceptual information, for example, "this label is misleading,"

"this is all a game suggested by the experimenter," and so on, do not enter in the processing of the threat-detection module, because they simply do not match its input format. So they do not modify this particular system's inference that there is a threat in the environment. And given that one system in the mind is shouting "danger!" (or rather some neural equivalent) and most other cognitive systems have nothing to say about which glass is better (because there is no information to the effect that the other glass is in fact better), this may trigger, in many people at least some of the time, a slight preference for the glass with a reassuring label.

This all make sense . . . but note that in this interpretation, neither the person nor indeed any part of the person can be described as believing that "there actually is poison in the glass labeled 'poison.' " This is true even of the threat-detection module, whose sole function is to make some parts of the environment salient and activate fear or defense responses, not to provide descriptions of the reasons for these responses. So we have a (somewhat) satisfactory explanation of why people prefer one glass to another. But in the meantime, we have quietly discarded a central part of our everyday psychology, the idea that behavior is explained by a person's beliefs, stored and evaluated in a central belief-management unit.

Anthropomorphism about human minds often results in the intellectual disease I shall call cognition blindness, which makes it difficult to keep in mind that the most trivial behavior requires a bewildering complexity of underlying computation. Cognition blindness used to be universal, and is still endemic, in the social sciences. To reprise one of our examples, can we describe young women who grew up in deprived conditions as "realizing" that their social environment makes it unlikely that they will meet a nurturing husband? Can we say that they "decide" to accelerate menstruation to allow precocious sexual activity? This of course would be very odd. It seems more sensible to say that some information about the social environment, like father presence, is handled by specialized systems, while other information, for example, concerning friendships or nutrition or ethnicity, is handled by other systems, and that their interaction predicts changes in preferences and behaviors.

Rule IV: Ignore the Ghosts of Theories Past

The study of human behavior is encumbered by the ghosts of dead theories and paradigms. It is extraordinarily difficult to stamp out those importunate, zombie-like pests. For instance, it seems that explaining human behavior requires that we talk about "nature" and "culture," or the various contributions of "nature" and "nurture" to our behavior. Or it may seem possible and also really important to distinguish what is "innate" from what is "acquired" in our capacities and preferences. Is the propensity to engage in warfare "cultural" or "natural"? Do the obvious differences between men's and women's behaviors result from nature or nurture? Could moral feelings be somehow natural, a product of our "biology," or are they the product of social pressure, of cultural norms?

These oppositions generally imply an antiquated vision of genetics, in which stable and inflexible genes interact with unpredictably diverse and changing environments. But that is doubly misleading. Environments do include many invariant properties, which is why natural selection can work. In fact, I mentioned one such property when I described a highly stable aspect of migrating birds' environment, the apparent motion of Earth through the seasons, which makes it possible for a genetic adaptation to limit the birds' reproduction in an adaptive manner. Conversely, gene activation can be switched on or off by other genes, by coactivators, repressors, and a whole menagerie of other nongenetic material in the gene's chemical environment. Indeed, a great achievement of molecular genetics has been to show how these multiple interactions result in the construction of highly complex traits and behaviors from relatively simple genetic material.[33]

That is why the fact that a behavior is an evolved trait of organisms, that it is a consequence of natural selection, does not mean that the trait or behavior itself is encoded in particular genes, as the example of seasonal reproduction in birds made clear. Nor does it suggest that the trait or behavior occurs invariably, regardless of external circumstances, or that it is inflexible, impossible to modify, or somehow present in organisms when they are born. It suggests only that it happens in most normally developing organisms, when they encounter conditions similar, in the relevant respects,

to the environments in which their genes were selected. Very different environments would lead to very different outcomes. Migratory birds raised in a spaceship would probably reproduce at a very different pace. As we know from actual, tragic cases, children growing up in complete isolation cannot fully acquire typical human language.[34] But as long as the environments encountered include the same invariances that made genetic evolution possible, we can predict that development will result in those capacities and preferences that are typical of the species.

We can now consign the ghosts to the attic, because we have a much better understanding of how minds learn from environments. Here I described some typically human behaviors, like learning the language spoken in one's group, or adapting one's sexual behavior to the social environment, or inferring people's intentions from their gaze, as probable consequences of human evolution. As we go through many other typical human behaviors, particularly those that contribute to building human societies, we shall see how in each domain it makes little sense to try to mention nature and nurture, as if those terms had a stable meaning.[35] It makes even less sense to talk about human "culture" as a real thing in the world.

The Positive Program

A proper social science should answer, or at least address, the pressing questions I listed at the beginning of this chapter—to sum up, why do humans engage in those social behaviors, like forming families, building tribes and nations, and creating gender roles? The best way to answer such questions is to do science, because the best way to understand the world in general is to do science. Humans never invented anything that goes as deep as scientific investigation into understanding why the world is the way it is, nor have we found any other way of seeking knowledge that gets it so consistently right. Doing science is also difficult and frustrating, and in many ways goes against the grain of our spontaneous ways of thinking.[36]

There are of course many skeptics who think that human societies and cultures just cannot be studied the scientific way. Some see the social world as just too complex to be successfully explained in terms of simple

and general principles. Others, in a more radical way, state that human meanings or beliefs belong to a special domain of social or cultural things, which is forever closed to scientific explanation. I shall not dwell too much on these debates, because the best way to counter these conceptions is simply to demonstrate that there are indeed scientific explanations for particular social phenomena. Then, the philosophy will follow the science, as it usually does.

The following chapters chart some elements of this naturalistic science of human societies, from the way we form groups to the way we interact in families, from human attraction to religious notions to their motivation to create ethnic identity and rivalry, from the intuitive understanding of economics to their disposition for cooperation and friendship. This should not imply that we now know all there is to know about those topics—far from it. But we can already perceive how they make more sense in the context of human evolution. There is great promise in that vision, some would have said even grandeur, if we can make progress in explaining human behavior as a natural process.

Conclusion

Cognition and Communication Create Traditions

HUMANS STAND APART FROM OTHER species in the amount and diversity of information they acquire by paying attention to other humans' behavior, to what others do, and, crucially, to what they say. It is difficult for us to realize how much information is socially transmitted, because the amount is staggering and the process is largely transparent. There is an ocean, a mountain, a continent—such metaphors are all apt and all misleading—at any rate, an extraordinarily large amount of information that is being transferred between people, at any point, however small the community. Information is our environment, our niche, and as we are complex animals we constantly transform that niche, sometimes in ways that make it possible to acquire even more information from our surroundings.[1]

This metaphorical ocean of information is where we find what people call human culture, or the different human cultures. Those terms, it must be said, are very vague and hugely misleading, and their use often led to complete confusion in classical anthropological theories. That is because the terms almost inevitably carry implications about information and human psychology that happen to be quite clearly on the wrong track—a problem I discuss below. Fortunately, we do not need to start with a definition of these words in order to ask meaningful questions about the transmission of information in human societies—just as you need no clear definition of matter to ask meaningful questions in physics, or a definition of life for biological questions. So here are some questions about information and its transmission.

In all human communities, people seem to "share" some mental representations. I use quotation marks around "share" because people of course do not share them in the same sense as we can share a meal. What we mean is that the representations in different minds seem to have some similar features. (That ambiguity about sharing is the first of many confusions created by terms like "culture.") To reprise an example from previous chapters, the notion that children are members of their maternal uncle's clan but not of their father's is found in a roughly similar form among people who happen to live in a matrilineal society like the Ashanti. Or the idea that shamans have a specific internal quality that makes them different from ordinary people, as commonly found among Fang people in Gabon.

This raises the question, Why are there such similarities in people's representations? This is where we run into another confusion created by the notions of culture or cultures. Because we have a name for something, we may be tempted to think that it actually is a thing, a coherent set of realities. That would be bad enough in this case. But, even worse, we may be tempted to think that the term by itself is an explanation, that the Ashanti assign clan membership though the maternal line because it is in their culture, as people sometimes say. But that obviously cannot be an explanation. Saying that the norm is part of Ashanti culture is tantamount to noticing that the representation of the norm is similar in the minds of many Ashanti people. The would-be explanation is circular.

So the question, Why do people who communicate have similar representations? points to a real problem. Among the multitudes of mental representations that a human mind entertains in the course of ordinary behavior, only a minuscule proportion are similar to other individuals' representations. We constantly build and update representations of our physical environment that are of course unique in some respects, as each individual has a unique perspective on the surrounding objects. We have representations of the social world around us that are also unique, since we are each the center of many networks of social relations, and nobody else occupies that particular position. Just as obvious, communication does not automatically create similarity of representations, nor is it intended to do so. If you make a request, you do not intend listeners to entertain that very same

request. You want them to entertain a motivation to satisfy your request. Even when we use declarative statements we do not create mental representations similar to our own. If you state that roasted pangolin is delicious, that does not make your listeners think that it is delicious, it only makes them think that you seem to think so. All that may seem obvious, but sadly it is necessary to mention these familiar properties of communication, as they are often difficult to keep in mind, so dense is the fog created by notions like "culture."

Another question is, Why are there recurrent features in these representations in many different human communities? Consider the notion that shamans or other healers have some special substance or quality or additional organ. This is found, in a rich tapestry of different forms, in various places in Asia, the Americas, and sub-Saharan Africa. Why do people in such different places home in on this notion of internal essence? Or consider the idea that you belong to your mother's lineage and her brother's but not to your father's. That is common to Trobriand islanders in the Pacific and the Senufo in West Africa, as well as the Hopi of North America and the Nayar of India, and many others. Obviously, the same could be said of almost any feature of local norms and ideas reported by anthropologists. For instance, in many places in the world you will encounter the idea that social groups are different for natural, essential reasons—that, for example, ethnic categories correspond to different species of humans, or that individuals from different castes do not have the same physiological nature. Or people in many places have some notion that deceased individuals still exist as persons, despite physiological death, and can interact with the living. And people in many places consider that malevolence and magic explain misfortune better than random contingencies.

None of these is, at least at the surface, a universal human representation. You can have healers without a special organ—that is the case for herbalists in many African societies, and of course of modern physicians. You can have a society without lineages, like bands of nomadic foragers or modern mass societies. You can have social categories without essentialism. You can have notions of death without a surviving spirit, and of misfortune without agency. But even if they are not universal, these representations are

remarkably frequent in human groups. Why is that the case? What explains cultural recurrence?

So, dispensing for the moment with confusing notions of culture, we have two questions for a natural science of societies, namely, How do people converge on similar representations through communication? and Why are some themes so common in such diverse, unrelated societies? At the risk of ruining the surprise, I should reveal that these are in fact one and the same question, which we can address in a rigorous manner by considering the way human minds infer new representations from communication.

Traditions

Let me start with similarity within a community. Some small parts of the immense domain of mental representations entertained by people in a group seem to be roughly similar in the minds of different people, as a result of past communication episodes. A convenient term for these islands of similarity in an ocean of unique content is "traditions." These are simply sets of mental representations and associated behaviors that have some stability in a particular social group.[2] Contrary to what the term may suggest, traditions in this sense may or may not last. Some traditions persist for centuries while involving very few individuals, like the art of choosing and mixing registers of different timbers on the organ or the art of making kabuki theater costumes in Japan. Short traditions include all those fashions that quickly spread and vanish even faster, like so many flashes in the cultural pan. As these examples suggest, the duration of a tradition and the number of people involved are orthogonal dimensions. Traditions may be established between a few individuals, or they could reach millions. The writer Natalia Ginzburg provided a good illustration of a very small-scale tradition in her book *The Family Lexicon,* listing a number of odd words or usages used by her parents and siblings in prewar Italy. The father in particular had coined (or acquired from distant relatives) a series of partly invented terms as well as mixtures of German and Italian.[3] Many families have such small-scale traditions, even though these often reduce to a handful of special words or idioms. At the other end of the spectrum, some traditions

are held by thousands or millions of individuals. Long before modern communication techniques made extensive diffusion possible, millions of people had acquired and transmitted folktales like *Cinderella* or the legends of Krishna and Ganesh, melodies like "Greensleeves" and hairstyles like the Manchu queue, not to mention largely widespread religious beliefs. So, when we say that these representations are roughly stable in a social group, we should understand this in the most flexible way. Any collection of people who are connected by some communication episodes can be said to have created a tradition, if those events result in roughly shared representations. This is a very broad and extensive understanding of traditions, but it should be sufficient to point to many problems with our common assumptions about information and transmission.

In particular, we may miss some crucial aspects of cultural transmission because our folk sociology, and the many social science theories that reflect its assumptions, expect widespread representations to persist. In that view, only change requires a special explanation. Social scientists for a long time assumed that there was nothing special to explain in the fact that many Venetian and Xhosa customs or ideas were very similar to what the Venetians and the Xhosa of the previous generation had been doing or thinking. In this perspective, one expects the stories of *Cinderella* and *The Monkey King* to be transmitted from generation to generation—the fact of stability does not require any special cause, as if there was some cultural equivalent to the law of inertia for physical objects.

But it is stability that is mysterious. Most of our utterances are not recalled by our interlocutors, most of what they recall is drastically edited, and the part that they may transmit to others depends on their motivations as well as myriad other factors—so that the ocean of information transmitted by human beings is a place of high entropy. That question had been raised by some scholars, notably Gabriel Tarde at the beginning of the twentieth century. Tarde had tried to explain how large-scale cultural effects, for example, the diffusion of a fashion or a political ideology, would result from the aggregation of many interactions between individuals, and in particular in the proportion of imitation and innovation in the way each individual's behavior was shaped by that of others.[4] So the difficult

problem for social scientists would be to explain how individual encounters led to large-scale social effects. Unfortunately, these ideas had very little effect on the social sciences at the time, so that few people realized that, in the face of entropic communication, the improbable stability or spread of some representations is the true mystery, the phenomenon to explain.

Transmission as Selection

The transmission of cultural information was not properly studied in classical social sciences, at least not before the 1970s. Things started to change when biologists and anthropologists began to consider cultural transmission as a population phenomenon. The inspiration came from evolutionary biology, which had shown how the evolution of species, a large-scale phenomenon, could be explained by the aggregation of small changes in the replication of genes in individuals. Since culture is just the name of large-scale properties of information held by many individuals, and the only process whereby information is processed occurs inside individual brains, it seemed possible to propose for culture an analogue of biological evolution.

The most important development in this respect was the publication of Rob Boyd and Peter Richerson's *Culture and the Evolutionary Process,* which for the first time proposed clear theoretical tools for describing and explaining cultural processes.[5] Although there were antecedents in this view of culture as composed of different units with a different likelihood of transmission, these were not as systematic, nor were they as usable as the model provided by Boyd and Richerson.[6]

The starting point of the model was that cultural material comes in different packets of information, called memes, transmitted from individual to individual. The notion of memes had originally been proposed by Richard Dawkins, and it then formed the starting point of many attempts to describe cultural material.[7] In this selectionist perspective, trends in cultural evolution, for instance, the persistence of a particular tradition or its downfall, the fact that some ideas can diffuse to large communities or on the contrary remain confined to a few individuals all stem from the relative

selective success of different memes. This was a transposition to cultural material of the successful model of genetic evolution, based on mutation and selective retention.[8]

The theory described biases likely to affect transmission, that is, to push the evolution of cultural materials in a particular direction. The frequency bias, in analogy with frequency-dependent selection in genetics, specified that, all else being equal, more frequent memes would be more likely to survive transmission than rare ones. In other words, individuals who could perceive the difference in frequency between two memes would be likely to pass along the more frequent ones—in what could be called conformist transmission. This conformist attitude would make sense in a species in which a vast amount of crucial information is acquired from others, rather than from direct experience. In effect, trusting the more frequent meme, for example, cooking your stew the same way most people do, amounts to taking advantage of previous generations' trial-and-error-driven progress toward an optimal solution. Another factor in transmission would be a prestige bias, whereby we tend to adopt the memes (ideas, practices, ways of doing and communicating) of successful individuals. Even in groups with simple technology there are differences in the efficiency of particular gestures or methods, as in hunting or fishing or toolmaking. Finally, the formal model included what were called content biases, resulting from the fact that the human mind is predisposed to acquire or communicate some representations more easily than others, which would, for instance, explain why some tunes (like "Pop Goes the Weasel") are acquired easily while others (like Alban Berg's Lyric Suite) are not, in the same way as the plot of *Cinderella* is easier to narrate than that of James Joyce's *Ulysses*.[9]

This dual-inheritance theory, using mathematical models from population genetics to describe cultural transmission, allowed anthropologists and archaeologists to formulate hypotheses about transmission with much more precision than traditional social science models had provided. There were of course some problems in the application of the models. For instance, the prestige and frequency effects predicted by the model only occur some of the time. People may imitate the upper classes in etiquette, but they just as often adopt the accent or vocabulary of the *vulgum pecus.*

Simple frequency biases would predict bandwagon effects that sometimes happen, and just as often fail to occur.

A more difficult problem was the process of transmission. The model assumed that imitation was the main path of information transmission—a process whereby a mental representation would be created by copying some observed behavior.[10] This is assumption was in fact shared by most models of culture based on a notion of memes, from Dawkins on to the l ater developments of what some people called "memetics."[11] At first sight, imitation seems a simple enough process. An individual hears "Pop Goes the Weasel" and forms a mental representation of the series of pitches and rhythms that constitute the tune as it was sung, whistled, or played. This representation then produces behaviors like whistling or singing a series of notes that (roughly) replicate the original performance. But even this simple example suggests that imitation is far more complicated than it seems.

First, obviously, imitation does not explain why some tunes are easier to replicate than others, why "Pop Goes the Weasel" is an easier meme to transmit than the first violin line in the Lyric Suite, which is not really more complex. That is why Boyd and Richerson had found it necessary to include "content biases" in their model. But these biases were left as an empty placeholder. The theory specified that they must exist, but it did not say anything about what they consisted in (as that was not the point of the dual-inherence model).

Second, even in the transmission of a humble and simple tune we find another feature of cultural transmission that is often ignored but happens to be of major importance, namely, that people's mental representation sometimes turns out to be better, so to speak, than the material supposedly imitated. People who hear "Pop Goes" played on an out-of-tune piano or sung by a tone-deaf amateur can still mentally represent it as the correctly pitched series of notes, and if they have the relevant skills, they can produce a more melodically correct version of the tune. So the process of transmission does not reduce to imitation. It ignores some actual properties of a model and is guided by something other than what was observed.

These two problems with imitation are related. The reason some elements of behavior become traditions and others do not is that creating a

tradition does not really consist in imitation but includes the constant reconstruction and correction of input. This is all to do with those content biases predicted by the dual-inheritance model—among which we should count most of the dispositions and preferences documented in the previous six chapters. People are more likely to hold concepts of superhuman agents than of other possible supernatural notions. Rumors spread quickly when they describe potential threats. Descriptions of a complex economy are filtered through the templates provided by our intuitive sense of fairness. Stereotypes associated with social groups spread more easily if the group is construed as essential—it is in the nature of the members, so to speak, to do what they do–than if it is explained as mere accident. To complete this model of transmission, we need to include all these elements. In sort, we need much, much more psychology.

An Example: Social Essentialism

Ethnies and many other social groups are often construed in terms of natural differences. That is, people think there is some real, internal difference between groups such that members of group A are not and could not possibly be members of group B. One is a member of a particular group from birth, on the basis of inheritance.[12] For instance, the Mongol nomads interviewed by the anthropologist Francisco Gil-White were quite clear that Mongols and Kazakhs are different kinds of people, that it is not just an accident that they belong to different groups. For the Mongols, what makes each Kazakh person a Kazakh is not just that he speaks the language, or appreciates Kazakh food, or likes Kazakh customs—since some people who do none of these things are still Kazakhs. If you are born of Kazakh parents you certainly are a Kazakh, and remain so for the rest of your life, whatever changes may occur in your behavior. There is something special, some "Kazakhness," so to speak, that makes you behave the way you do, that creates a propensity to act like other Kazakhs, although that "something" is left undefined.[13]

Such representations of social groups as natural are found the world over. In many tribal societies, a widespread model construes lineages as

based on the transmission of a special substance, metaphorically described as the permanent "bones" or "blood" or other substances embodied in transient individuals.[14] The caste ideology of classical India is another example. People belong to specific groups or *j ti,* each of which is traditionally attached to particular tasks or professions, for example, street sweepers or blacksmiths or royal functionaries or merchants, that are supposed to be so fundamentally different from each other that members of two distinct groups cannot generally share food or lodgings, let alone have sex. All these groups were (and in many places still are) ranked in strict order of purity—and the thought of contact with a member of an inferior caste is to many people disgusting. The traditional ideology made a clear connection between occupation and status. Tanners or undertakers were quite impure because of their contact with corpses. But this connection was not really considered the reason for someone's status. After all, Tanners or Butchers who stopped tanning or butchering, or indeed had never engaged in these activities, were considered just as polluting and disgusting as other members of their castes. In fact, in modern conditions most of the occupations traditionally associated with these castes have disappeared, but the castes themselves and their hierarchy are still present.[15]

Ideologies of natural differences are also invoked to justify ostracism against despised minorities. These may be members of culturally specific groups (Ainu in Japan, tribal people in India) or technical specialists (undertakers, blacksmiths, or potters in many societies in Africa and Asia). This form of social stratification is often accompanied by the notion that members of these groups are often thought to be naturally different from the rest of society. Finally, racialist ideologies may be the most salient manifestation of the belief in natural differences between groups. The notion of Jewish or black or white "blood" is among the metaphors that express the assumption of innate and ineradicable differences.[16]

In more general terms, people are essentialists about a social category when they assume that (a) all members share some special quality that is exclusive to the category and need not be defined, (b) possession of that special quality is a matter of biological descent, not historical accident or acquisition, and (c) that special quality is what makes them behave in particular ways.

Why is the ideology of essential natural differences so widespread and so compelling? Perhaps it is because our minds somehow mistake human groups for species.[17] Indeed, essentialist intuitions are very robust and explicit in representations of the natural world. Human minds intuitively construe animal species in terms of species-specific "causal essences." That is, their typical features and behavior are interpreted as consequences of the possession of an undefined yet causally relevant quality that is particular to each identified species. There is something special about giraffes, for instance, that they are born with, a giraffe-ness that makes them the way they are. This assumption appears early in child development, and it is implicit in our everyday biological knowledge. We acquire a lot of information about the various animals and plants we can observe, because we have an intuitive sense of how we can infer from instances to species. After observing a single animal behave, even young children know how to extend that information to all members of the species, and they use membership of a species to override perceptual appearances. Our biological essentialism is entrenched, and certainly adaptive.[18]

So it may be that social categories may be construed as quasi-natural kinds because this kind of inference is already salient in human cognition. Also, some features of the representation of ethnies resemble some input conditions of the intuitive biology inference engine. According to Gil-White, humans process ethnic groups (and a few other related social categories) as if they were species because people apparently inherit ethnic identity from their parents, and ethnic groups (at least in some regions) do not intermarry.[19] In this view, people are somehow overextending their spontaneous essentialism whenever some cues match the input conditions of the essentialist inference engine. Our minds simply misconstrue ethnic categories for living kinds.[20] This would make sense, in a parsimonious way, of a great variety of recurrent cultural representations about groups.

The interpretation, however, is not completely satisfactory, at least not in this form. It implies that our intuitive biological systems make a mistake in considering social groups as species, simply because of the cues of endogamy and inheritance of group membership, in the same way as our visual system, for instance, can be fooled by two-dimensional perspective

into seeing depth and volume where there aren't any. But that is not quite happens. Endogamy is a prescriptive norm about marriage with strangers, not a fact about sex with them. In all societies where ethnic endogamy is enforced, people know perfectly well that it could be violated and would result in human offspring. You could have offspring with a Kazakh. Indeed, tribal warfare for much of human evolution included episodes of rape and abduction, suggesting that even when you call the other tribe subhumans or cockroaches, at least some of your brain systems take then to be human just like you, precisely as far as reproduction is concerned. In places where there are strict prohibitions against marrying outside the caste, people know perfectly well that sex across the caste line is possible and may result in viable offspring. That is indeed the whole point of enforcing strict caste prohibitions in the first place, and other similar laws against "miscegenation" between races.

So how can people hold beliefs about groups that seem compelling yet are partly inconsistent and include concepts that remain largely undefined? This is obviously not the case only in the domain of social essentialism, which serves here as an illustration of what happens in many other domains of cultural transmission. To understand this, we need yet more psychology.

Intuitions and Reflections about Other Groups

Here it may be of help to keep in mind that essentialist understandings of groups are not intuitive, in the sense of being spontaneous and effortless representations that just pop up, as it were, when we are faced with people of another group. Consider the range of automatic inferences and conjectures likely to come up when we encounter people of a different group. The conjectures will be about their intentions (Are they friendly? Do they want to trade? Is this an ambush?), about their capacities (Are there many of them? Do they look fierce, strong?), about their attractiveness, the oddity of their language or accent, and so on. But all these inferences or conjectures imply that we are dealing with human beings like us. We can measure their strength by looking at their arms, their

aggressiveness by scrutinizing their faces, and so forth, because we use such cues to evaluate other people in our own group. So the intuitions, the mental representations delivered by automatic and largely unconscious mental systems, imply that the "Others" are of the same nature as "Us." There seems to be a clear discrepancy between these intuitions, on the one hand, and explicit statements, such as "different ethnic groups are like different species," on the other.

At this point I must explain in more detail the distinction, most clearly formulated by Dan Sperber, between intuitions or intuitive understandings, with their underlying cognitive machinery, on the one hand, and reflective information and beliefs, on the other. An intuition or intuitive understanding, for the sake of this argument, is simply the occurrence of some information that is potentially consciously accessible and directs the agent's expectations and behaviors, although the pathways that led to holding that information are not accessible to conscious inspection.[21] Consider for instance the following situations:

a) an infant expects a solid object on a collision course with a solid surface to bounce against it, not to fuse into it;[22]
b) after dissecting a crocodile and observing its innards, a person who is asked what is inside another crocodile spontaneously assumes that it must be the same stuff, but she is less confident if the second animal is a snake;[23] and
c) people primed with briefly flashed pictures of males from a minority group tend to misidentify subsequent pictures of tools as weapons, while they make the opposite mistake when primed with male faces from their own ethnic group.[24]

In each domain considered here, intuitive representations just pop up, so to speak, as a largely automatic and fast result of being presented with the relevant stimuli.

Reflective information, on the other hand, is information that has the effect of extending, making sense of, explaining, justifying, or communicating the contents of intuitive information. For instance, in the cases described so far, we can have the following reflective processes engaged:

a) people asked about the trajectories of objects explain them in terms of "impetus," "force," and "bouncing";
b) informants tell us that there is some unique quality in each animal that makes it a member of a species, and that it must be inherited—it cannot be acquired; and
c) people say that members of a particular ethnic group are lazy, aggressive, irresponsible, and so on, and that they are born that way—it is their nature.

This difference between these two kinds of mental representations should help us understand the cognitive processes most likely at play when people acquire information from others, in such a way that they build roughly similar representations, what we call "cultural" concepts or norms.

We can now return to the case of essentialism about social groups. Encounters with members of different groups are bound to trigger specific intuitive representations, as I described at some length in chapter 1 when discussing intergroup conflict. For instance, running into various members of the Poldovian people, and having information about the language they speak, what they eat, and what they wear, or whatever they do that is not familiar among one's own kin and acquaintances, we may have intuitions like these:

[1] Poldovians are not like us
[2] Poldovians are like each other
[3] Poldovians have common goals
[4] I cannot trust this person! She is a Poldovian

. . . which (may) trigger spontaneous reflective explanations like these:

[5] There must be something that makes Poldovians similar
[6] In some way, Poldovian newborns are already Poldovian

. . . and so forth. Now these reflective thoughts may occur to any individual, faced with differences in behavior, or any other differences, that seem to map onto social categories. But, obviously, such an individual lives in a social environment and acquires information about the relevant social

categories from other individuals, information that may for instance contain statements like these:

[7] Once a Poldovian, always a Poldovian!
[8] Blood is thicker than water
[9] Different groups are like different species

. . . which, to some extent, carry implications that are very close to one's intuitions (for example [1–4]) and spontaneous reflections (for example [5–6]) and, to that extent, are likely to be attended to, included in people's store of plausible beliefs, and in some cases communicated to others (in a roughly similar form), creating the chains of transmission that constitute a tradition.

In cases like these, some specific representations are likely to become part of a tradition, because of the fit between the public statements (for example, that blood is thicker than water), on the one hand, and the contents of many individuals' intuitive and reflective representations, on the other. This talk of "fit" is of course much too vague. In the domain of social essentialism, the connection is that the explicit statements that people receive, and (often) repeat, provide a causal context for their prior intuitions. That is to say, reflective thoughts like "blood is thicker than water" provides what sounds like an explanation of prior intuitions. Other reflective representations, like "Once a Poldovian, always a Poldovian!" just seem to expand the scope of our intuitions, without really adding further explanation. So there may be many ways in which reflective representations are associated with our intuitions.

An important point here is that the reflective thoughts, either spontaneously activated in an individual mind or acquired from others, are not necessarily coherent, consistent, or satisfactory as explanations. That is certainly clear in the case of essentialist statements about ethnic groups or castes. The term "jāti" is used to qualify castes but also means "birth" or "species." It strongly suggests that members of different groups are as different as animals from different species. It may fit people's intuition that they would rather not mingle with members of other groups. But it does not really explain in what way groups are like living species. The same is

true of other essentialist understandings, as I mentioned before. People may describe the other group as nonhuman or not fully human—that is indeed the most common form of xenophobia the world over—but such statements clash with many other intuitions (for instance, concerning these other people's thoughts and beliefs, their sexual attractiveness, and the like) that clearly indicate they are treated as humans.

Reflective representations can persist despite providing no explanations, poor explanations, or even incoherent explanations that conflict with our intuitions. This can happen, without individuals being irrational or confused, because, as Sperber pointed out, most reflective beliefs of this kind are metarepresentations, representations about representations.[25] For instance, the statement "Different groups are like different species" does not carry any clear implications about the way they are different, and is probably mentally represented as "In some way or other, it is true that 'different groups are like different species.'"

This lengthy description of the processes involved in transmitting a simple notion, like that of essentialized social groups, should suggest that cultural transmission is far from being the simple process we imagine, when we say that people just "absorb" the local "culture." In particular, it should also illustrate the fact that imitation is a terrible explanation for transmission. Imitation consists in copying surface features of observed behaviors. But that is not at all what happens in the transmission of essentialism for example. People can hear others saying that "Poldovians are different" or that "blood is thicker than water." They may sometimes repeat the words verbatim, which would be a case of imitation. But the fact that people are essentialist about social groups goes much further than that. It consists in people assuming an undefined quality that is present in all members of the category, and only those. It also consists in assuming that the internal quality can cause external behavior, but causation cannot go the other way around, so that external circumstances have no effect on essential qualities. But in the many societies where people have essentialist understandings of groups nobody ever uses such theoretical, indeed metaphysical, talk to describe groups. So the thoughts were produced not by imitating other people but by producing complex theoretical inferences (many of which

remain unconscious) on the basis of other people's statements or behavior. In this case, the similarity in these thoughts is easy to explain, as an effect of the essentialist expectations we spontaneously entertain, particularly when thinking about living species. By transferring some (not all) assumptions and inference rules from our intuitive biology systems to our understanding of groups, we produce a partly coherent reflective representation of these groups. Because other people have the same form of biological essentialism as we do, their representations of groups ends up being very similar to ours. But, clearly, imitation is not what happened here.

Another general lesson from this particular example is that individual minds, instead of simply selecting information among what is offered by others, actively construct models that go far beyond the information given. I already mentioned that we can infer a correct melody from an out-of-tune rendition. Far from being exceptional, this process is central to the transmission of information, and we must describe it in more general terms.

Communication Requires Inferences

Human communication consists in reconstructing intentions. That is to say, when we communicate we do not upload mental representations from our minds to someone else's. What we do is produce some observable behavior, which together with masses of other information produces in the listener some representation of what we were intending to communicate. That view is both consistent with the evidence from pragmatics, the study of language use in conversation, and in direct conflict with a simpler, misleading but very persistent view, a code model of communication. In that code model, if we have a thought that we want to express, for example, that there is a large crocodile in the room, we use a series of symbols from our linguistic code, which produces the sentence "There is a large crocodile in the room!" Upon hearing that stream of sound symbols, the listener now has a new belief stored in her mind, namely, that there is a large crocodile in the room.

As linguists started to notice from the 1960s, there were many problems with that picture. One obvious problem is that most human communication

occurs without any such close correspondence between what is said and what is meant. If I ask "Does she take care of her health?" and you reply "Well, she walks three miles on mountain trails every morning," you managed to communicate some information to the effect that she indeed takes care of her health. But it would be clearly absurd to conclude that the sentence "Well, she walks three miles on mountain trails every morning" is the code for communicating that particular fact. Indeed, that same sentence can be used to convey a very different meaning, for example, as an answer to the question, "Does she have a hard life, so young and so far away from school?" Linguists started revising the code model to make sense of such effects. As the philosopher Paul Grice pointed out, communication often seems to work as though speaker and listener had agreed on some tacit principles about the best way to convey information.[26] For instance, in actual conversations simply stating a true fact may also be highly misleading. Asked if he has children, King Lear might say "I have two daughters, Regan and Goneril"—but most people would find that utterance disingenuous, even though it is literally true. Not mentioning the third daughter violates Grice's principles of conversation.

In the end, pragmatics allows us to dispense with the encoding-decoding model altogether. This perspective was initiated by Grice, and developed by others, Deirdre Wilson and Dan Sperber in particular.[27] Rather than patch or repair the code model, pragmatics specialists argued that we should think of communication in a fundamentally different model, based on the perception of speakers' intentions. The main assumption of this "ostensive-inferential" model of communication is that the sender (that is, the speaker in the case of verbal exchange) produces external behavior (this is the ostensive part) designed to guide the receiver's cognitive process toward an interpretation of what he intended to communicate (this is the inferential part). As a reply to "Does she take care of her health?" the utterance "She walks three miles a day" suggests that the walks are to be considered as a clue that may lead to an answer to the original question. This is what Sperber and Wilson call the presumption of relevance. Producing an utterance signals that the sender expects the receiver to accept that what is produced is relevant to the topic at hand.

This is pertinent to cultural transmission, to those events that become parts of a chain of transmission and sometimes result in a tradition. Two characteristics are crucial here. One is that traditions are built by inference, that is, by the fact that minds go beyond the information given, to coin a phrase. The other is that inferences require background knowledge. Both are quite clear in the domain of everyday conversations. First, the thoughts that occur to an individual as the result of an utterance are generally not a direct translation of what was said. To understand how roughly similar representations could be held by Jack and Jill, as a result of Jill talking to Jack, the literal content of what she said to him is only the starting point. To proceed from that to his subsequent thoughts, we need to add a large amount of material that Jack spontaneously added to the utterance. Second, these inferences require that Jack mobilize previous information, notably knowledge stored in memory. For instance, "Well, she walks three miles on mountain trails every morning" could trigger the inference "She does take care of her health" or "Her life is hard, especially for a child," depending on the context. But each of these depends on activation of some additional information, to the effect that strenuous exercise is good for your health, in one case, and that it is rather rough on a child, in the other. There is no inferential work without such recruitment of stored information.

So if communication requires multiple inferences, and if these require prior knowledge, how do stability and change in traditions occur?

Attractors in Cognitive Space

Communication is an intrinsically entropic phenomenon. Communication follows unconstrained paths of inference. There is no way you can actually force some interpretation of your communicative behavior on others. So it would seem that inferences could go in all sorts of directions. At each point in a chain of communication, inferences could vary and create a proliferation of disparate representations.

That is indeed what happens—in most actual conversations. But once thousands of conversations are aggregated (the figure is a modest estimate,

an indication of the order of magnitude of communication events in a small-scale community), there are also recurrent patterns. These are what evolutionary anthropologists call cognitive attractors.[28] They are attractors in the statistical sense, that is, patterns that recur in the context of otherwise random aggregations of specific events. To get a rough idea of what that means, consider pouring a liquid on a surface that is not perfectly level. The liquid will run from higher to lower points, in the process creating small puddles, places where the liquid is trapped, so to speak—these are called basins of attraction.

Now consider the abstract space of possible cultural concepts. When people entertain a particular concept, it is located at a particular place in that space. When they communicate with others, this may result in those people constructing a somewhat similar, somewhat different mental representation. This process, if it was entirely unconstrained, would result in concepts that occupy many different places in conceptual space, with equal probability. But cultural transmission seems to work like the distribution of liquid on an uneven surface. Some positions are more likely than others to be filled.

The previous six chapters provided many examples of such cultural attractors. The notion of a spirit or god, that is, a person with counterintuitive physical properties, occurs very often, while the idea of a plant with those same properties is very rare. Statues that listen to people are common, but not statues that grow as time passes. Many people construe social categories as groups whose members share some undefined, inherited essence—the notion that social groups are accidental collections of individuals is much rarer in cultural space. The notion that misfortune is caused by malevolent agents, often endowed with mysterious powers, is more widespread than the idea of misfortune as contingency, or indeed than any other possible interpretation of misfortune. The expectation that a marriage should be publicized, that it involves people other than bride and groom, is more widespread than the idea of a purely private contract. In the most various domains of cultural transmission we can observe that some concepts or norms are more likely than others to appear in human cultures.

Liquids gather in particular places because of gravitation. Cultural transmission ends up with recurrent mental representations, particular places in conceptual space, because of the inference systems that make some notions easier than others to acquire, entertain, and transmit.

Naturally, for any specific case of tradition, these very general attractors combine with other, local factors that make specific representations more likely than others. For instance, there may be a general trend, in human minds, toward interpreting misfortune as the effect of some agents' intentions. In a particular place, people may also have a tradition that describes the souls of the dead as errant and resentful ghosts. The effects of this local attractor would enhance those of the general disposition to think of misfortune as caused by agents. General attractors, manifest in many different cultures, exist because there are many similarities in all human minds. Local attractors can be observed because redundant or repeated transmission enhances the likelihood that particular details will be represented in roughly similar form by many minds in a community. Not to put too fine a point on it, all actual traditions manifest these two kinds of attractors, as Olivier Morin points out.[29]

At the beginning of this chapter I mentioned two very general questions abut cultural transmission, namely, Why do people in a community (sometimes) happen to have roughly similar representations in particular domains? and Why are there recurrent features across very different places? The existence of attractors in conceptual space explains why these two are one and the same question. For instance, the availability of essentialism explains why people can infer the abstract notion of a shared essence from various particular statements about a social category, as I illustrated above in the case of the Poldovians. People in a group have the same intuitive expectations about species and their inherent qualities, which makes them converge on an essentialist interpretation of what they hear about particular groups in their environment. But that is true also across human groups. As essentialism about living things is general among human minds, we should not be surprised that its (partly coherent) extension to social groups is also found in so many societies. Similarity of representations inside a tradition, and recurrence of those representations across human societies, are caused by the same process.

Cognitive Tracks of Cultural Transmission

Attractors occur because communication requires inferences and access to prior knowledge. But, as I mentioned many times in the course of the previous chapters, mentally represented knowledge consists of many domain-specific stores of information, with their different input formats and inference rules. This would suggest that the emergence of attractors may take on very different forms and follow different processes, depending on the domain at hand. In other words, there could be very little that we can say about cultural transmission in general, because most of the action, so to speak, is a function of what inference systems are activated, and these systems have very different principles of operation.

If we consider distinct domains of behavior and representations that may show some similarity in a community, what we commonly call cultural material, it is true that the differences between domains are outstanding, and should be an essential part of any account of information transmission.

Consider for instance local ways of maintaining gaze, body posture, and appropriate distance in conversation. People in most of Africa would be embarrassed if you maintained eye contact with them—to them this would probably signal hostility—while most Europeans would be ill at ease if you did not. Such norms are sometimes made explicit (for example, "Don't point! Don't stare at people!") but also include many implicit expectations. What is the right distance to maintain during a conversation? The short reach that seems friendly to Americans would seem too great, possibly standoffish, to many Spaniards. There are very few systematic anthropological studies of these differences, even though they were identified as a puzzle for cultural transmission by no less an authority than Marcel Mauss, a founder of modern anthropology.[30] But what we know is that people in a particular community do have some parameters—they seem to agree, at least implicitly, on what is appropriate or too close for comfort—but no one is aware that they ever acquired that sense of appropriateness. It is only occasionally, when interacting with people from other places, that we realize that we have definite, though implicit, expectations in this domain, which we acquired without quite realizing it.[31]

As a contrasting case, consider the acquisition of stories. Whether we acquire stories in our tender years or later, this is an explicit process—that is, we are aware of the object that is learned, the plot, the characters, and the fact that all this is packaged as an object, for example, the story of the monkey that became a king. True, there are many aspects of story acquisition and retelling that remain tacit—notably the memory processes that make us forget or distort some aspects of what we heard—but the acquisition process itself is something we experience consciously. That way of acquiring something that is common to our community is, obviously, very different in its operation from the way we acquired the right distance to maintain between bodies.

Our knowledge of the natural world is another such domain, with yet another set of evolved dispositions and consequent constraints on traditions. Our knowledge of living species may vary a lot in its richness, from the atrophied competence that is typical of most modern societies, to the richly detailed botany and zoology acquired by members of small-scale communities with a simpler technology. Despite these differences, ethnobiology, as anthropologists call it, is based on similar principles the world over.[32] People use taxonomic frames to organize their biological classes, and the ranks used in biological knowledge are similar the world over.[33] Also, as I mentioned earlier, humans generally understand biological kinds in essentialist terms, that is, assume that each species or genus comes with a special internal substance that is inherited and produces the organism's external features and behaviors.[34]

So there are many different paths of communication, different tracks of cultural transmission. Even within a specific domain of behavior, some aspects of the common representations of the previous generation are acquired in systematically different ways. That is the case for language acquisition. Children learn the phonology, the lexicon, and the grammar of their language in different ways, operating distinct learning systems. One of those systems extracts a coherent phonology, a system of sounds from an environment that is, well, noisy, a process that starts even before birth.[35] Other systems provide heuristics for learning new words, producing plausible inferences about their meaning on the basis of previous knowledge, and

systematic assumptions, such as the notion that most words correspond to unique mental concepts.[36] Other heuristics allow children to infer syntactic structures from the one-dimensional stream of speech.[37] The fact that different systems are involved, at different stages of development, explains why distinct aspects of language change at different paces and in different conditions. The lexicon can change fast, notably among a large population with many opportunities for communication. Phonology can also change, but much more slowly, and often does as a result either of contact between languages or of class differences indexed by different pronunciations.[38]

One could multiply the examples. All this suggests that there is no general formula for the emergence of cultural attractors, no general process that results in the transmission of cultural materials. Rather, there are parallel processes that affect different domains, different tracks of transmission—which we cannot describe unless we have a good understanding of the underlying, highly specific psychological systems involved.

This account of cultural transmission stands in contrast to the notion that inspired many meme-based models of cultural transmission, in which there is one general mechanism that accounts for the occurrence of similar representations in different minds. Considering the ways cultural material is acquired by human minds does not reveal the cultural acquisition process, in the sense of a general set of principles that would be true of many different domains. Rather, it shows that the transmission tracks differ a lot from domain to domain—and the clearest example is the transmission of technology.

The Ratchet: Toolmaking and Technology

Technology is, obviously, uniquely developed in the hominin lineage. There are many striking examples of apes and birds using twigs and rocks for ingenious instrumental purposes, but these only underscore the uniqueness of humans in this respect. Technology is also the human trait that has the most profound effect on our ecological niche, on the way humans modify environments in adaptive and maladaptive ways. Technology shows that human cultural transmission can be cumulative, adding material to

previously transmitted information rather that replacing it, and in many cases adding material that makes our use of environments more efficient. The existence of technology raises the question of how humans managed to create ever more complex, and ever-improving, behaviors with an unchanged brain.

As technology changes a lot, it means that human minds must be able to extract the adequate information from what may be very different environments. Boyd and Richerson use the example of the construction of a kayak to emphasize that point. Kayaks are not simple or easy to make. (Incidentally, that is true of most "primitive" technology. Flint-knapping, or even the proper use of an atlatl, require quite a bit of knowledge and practice). The proper use of proper materials, as well as the inevitable trade-offs between desirable features in a kayak, imply that individuals must acquire vast amounts of detailed technical knowledge by observing others and interacting with them. As Boyd and Richerson point out, the recipe for kayak construction is certainly not encoded, as such, in our genes.[39] That, of course, is true of most human behaviors, as I emphasized in the first pages of this book. So, in the same way as for other domains of behavior, the question is not, Does this specific behavior depend on large amounts of external information? (because they all do) but, What evolved capacities make it possible for individual minds to acquire that information?

In the same way as for language or music, highly specific evolved capacities are involved in the acquisition of technical skills. Indeed, these capacities appear early in cognitive development, both in the way young children learn to handle objects, on the basis of available external information, and in the way they organize their mental representations of different objects' functions. Even young children have a sophisticated understanding of functions. They categorize objects in terms of their intended function, the motivations involved in their creation, rather than their actual use, and this occurs in societies with very different technologies.[40] They spontaneously construe structural features of tools in terms of those intended functions.[41] But the crucial mechanism here is the way young children observe and learn from adult models' use of tools and machines. Young children are often said to "overimitate" technical gestures. In experimental settings,

children confronted with a new set of behaviors associated with a new artifact, and with delivering a particular result, tend to reproduce all of the behaviors, including some that have no obvious causal connection to the goal and results. This tendency to associate results with all the detailed aspects of the behaviors that brought them about makes young children very different from chimpanzees, despite the latter's capacity for some tool use.[42] The term "overimitation" is misleading, as the children do not actually record and copy a series of gestures. For instance, they do not repeat the "irrelevant" actions if an adult has already performed them.[43] Although the phenomenon is well established, there is no consensus interpretation among developmental psychologists. One could see overimitation as an efficient learning strategy, balancing the low cost of including low-cost actions in one's performance against the possible loss of results. Or the tendency to overimitate could be linked to children's disposition to construe behaviors in a normative way, as the "proper" way to behave.[44]

These special capacities are involved in acquiring information about artifacts, tools, and instruments, rather than knowledge in general. They explain how the transmission of information makes it possible for people to build a kayak, on the basis of much observation, inference, and a lot of practice, as well as interaction with competent elders. Because of these cognitive capacities, there are certainly specific cognitive attractors in the transmission of technology, that is, combinations of ideas that are more likely than others to be included in stable technical traditions, although there is so far no systematic study of these effects of technical cognition on overall technological change.

Consideration of our evolved technical dispositions may also help us address the crucial question of technological change, namely, the possibility of accumulation and progress. In particular, we should try to understand how our technical dispositions allow the appearance of a ratchet effect, the process whereby techniques develop and then subsist rather than disappear, while other techniques build on the basis of previous ones rather than replacing them. Once a specific technique appears, it would seem, it is there to stay, which to a certain degree was the case for weapon manufacture, agriculture, metal smelting, and many other activities.

It is often tempting to see the emergence and cumulation of efficient techniques as a property of the human organism—speculating, for instance, that a special kind of imitation, or some radically new way of thinking, would explain the acceleration of progress in *Homo sapiens* after millennia and millennia of stagnation. But we should remember that technology is not, or not just, a matter of having clever individuals. It is also a population phenomenon, a matter of having individuals connected in the right way and motivated by the right incentives. In this respect, archaeology and history would suggest three main factors that explain the relatively late emergence of cumulative technology.

The first factor is division of labor, the necessary condition for creating techniques that, in their aggregate, go much further than the limits of one individual brain. Humans have known the minimal division of labor between the sexes for hundred of thousands of years. We know that even in technologically simple communities there is some division of tasks according to skills, some benefits from comparative advantage. We also know from the anthropological record, however, that this quickly reaches a demographic ceiling. The advantages of specialization become massive only when a large number of individuals are involved—what "large" means here is still an unresolved empirical question.

A second important factor, connected to the first one, is that communities can break the demographic limits by engaging in trade with surrounding groups. The explanation would be that trade, first, implies making the acquaintance of individuals with different traditions, and therefore allows what Matt Ridley calls "ideas having sex," that is, individuals being able to combine ingredients from different chains of transmission.[45] In other words, trade increases the number and diversity of chains of transmission, allowing the proliferation that sustains and changes traditions.[46]

A third factor, mostly relevant to the acceleration of technical change in large civilizations, is of course widespread literacy, as it multiplied the amount of technical information that could be passed on. Also, literacy allowed the appearance of blueprints, plans, tables of results, and other tools that gradually allowed the transformation of skilled craftsmen into early engineers.[47]

To sum up, having cumulative technology and then an accelerating technical progress does not require a special brain or a new brain, but it does require new conditions in which evolved minds can interact. The cognitive dispositions associated with toolmaking, and then recruited for the use of complex technology, are indeed special—they emerged in human evolution because of the fitness advantage provided by tools, which is why they are exquisitely appropriate to the understanding of tools.

Why Do People Believe in Culture? (And Nature?)

I started each chapter in the main part of this book with a specific question for the sciences of human societies. The substance of each chapter provided, not the definitive answer to any of these questions (obviously), but a large amount of information about the way the question can be addressed in an integrated account of societies, based on the findings and models of a whole variety of scientific research programs. I did not at any point refer to any demarcation or even distinction between "nature" and "nurture," or nature as opposed to culture. I trust the information provided in these chapters is enough to suggest that we can do a lot of scientific research without the hindrance of these confusing oppositions.

But these pointless distinctions are widespread, and despite the best efforts of proper scientists they are very much alive in the way research on human behavior is reported, with, for example, mention of particular behaviors being "hardwired" or "biological" or "innate," supposedly in contrast to others called "cultural" or "acquired." Some version of a nature-culture opposition, with the associated themes of universal versus variable, physiological versus mental, inevitable versus malleable, is among the crucial tenets of what John Tooby and Leda Cosmides called the Standard Social Science Model.[48] Such distinctions, one regrets to say, even disfigure otherwise well-informed discussions of human behavior, genes, evolution, and cultural differences. Why this extraordinary success?

Here is a speculative explanation. The nature-culture opposition may be one of those general cultural attractors I described earlier. Just like the notion of misfortune caused by malevolent agents, or that of social groups

as having a special essence, the nature-culture opposition may be the probable result of some of our intuitive and reflective thoughts, in such a way that it will reappear in different guises, but with a similar set of principles, at different times and in different places, even though it is not entirely coherent and is in fact largely subverted by our best science.

As a first argument for this conjecture, note that an opposition of this kind crops up in the most different of human societies. The Greeks reflected on the opposition of *physis* and *nomos,* for instance, and had the most extraordinarily diverse ideas about how to delimit them, what aspects of human behavior could be attributed to one rather than the other.[49] Those were the scholarly, systematic reflections of literate scholars. But we also find some nature-culture opposition in many small-scale societies without specialized intellectuals. In most African societies, for example, there is a clear opposition between the worlds of the village, on the one hand, and bush or forest, on the other. One space is cultivated, governed by norms, while the other is wild, unpredictable, uncontrollable. Because there are no specialized intellectuals, these oppositions are not turned into an explicit and consistent theory of human behavior, but they work as implicit principles that organize people's notions of social life. The same can be said of most tribal societies of Asia or the Native Americas. Obviously, one should not ignore the many differences in such conceptions. As the anthropologist Philippe Descola has documented, people's conceptions of the distinction between nature and culture can give rise to very different forms of speculation, such as animism, in which people imagine that animals or spirits may have thought and intentionality, or totemism, which emphasizes the continuity between some human groups and some animal species.[50]

Despite the differences in the reflective and speculative paths that people follow in entertaining such questions, it may be that the questions themselves are grounded in highly similar intuitions. Here I am of course going much further than the evidence would warrant, but the starting point of this speculation is not really controversial. People the world over have similar mental systems, which trigger (roughly) similar kinds of intuitions about many aspects of the natural and social world. There is no evidence that people from different regions in the world, for instance, could confuse

animate and inanimate objects, or that they could be thoroughly baffled by the notion of cooperation between nonkin, or that they would just not feel that killing those who helped you is immoral, or that they would not think of other people's behavior as governed by intentions and beliefs. Many other such intuitive systems guide our inferences and our acquisition of knowledge, as I mentioned in the previous chapters.

Now some of these systems might make a nature-culture opposition seem compelling. First, a form of mind-body dualism is almost inevitable in our reflections on behavior. It does not result from the adoption of philosophical theories about nature, since these are absent from most human societies. Instead, dualism is a straightforward result of the way our domain-specific inference systems are organized. Our intuitive psychology is a set of systems that produce descriptions and interpretations of behavior, notably of other people's behavior, in terms of invisible, indeed nonphysical, entities like thoughts and beliefs and intentions. From an early age, we construe them as nonmaterial, but we also assume that they have material effects, like, for example, making bodies move.[51] Our intuitions about bodies are grounded in specialized inferential systems about the physics of objects, while our intuitions about behaviors require appeals to these immaterial entities. Our evolved intuitive equipment does not provide causal bridges between these two systems, which is why all normal human beings are baffled when asked questions like, How did your intentions manage to move your arm? and even more puzzling, How did your intentions manage to move your arm in the particular way intended? So a notion of mental phenomena as separate from physical ones is, once formulated explicitly, quite compelling for human minds. Which is why some form of mind-body dualism is present in the most diverse human societies.[52]

Another set of intuitions may contribute to making some nature-culture opposition compelling. In all human communities, people have a conception of other groups as following norms different from "ours." Indeed, a distinction between one's own group as normal, central, and others as the aberrant case is the basis of much spontaneous ethnocentrism, found the world over. Also, as I mentioned in the previous chapter, children have no difficulty at all in acquiring the notion that social norms can be

both different in distinct groups and objectively imperative, so to speak. So it may be easy to acquire a notion of "culture," as designating whatever is different between different human cultures. By contrast, we also have a large number of intuitive systems that apply to other people, regardless of their norms—we expect them to have, for example, preferences for well-being rather than pain, for fairness over exploitation, for alimentation and sexual pleasure over deprivation, and so forth. Which would provide some intuitive substance to what people would want to call "nature," thereby making the opposition between cultural and natural phenomena apparently substantial, despite its lack of actual reference, because it is coherent with our intuitive expectations.

Whether or not this speculative interpretation is valid, one thing is certain—the nature-culture opposition is not culturally successful because of its explanatory power, because of its success in making sense of human behavior. As we saw in previous chapters, human minds use information about their surroundings, including during childhood, to organize life strategies, for instance, to invest in the long-term or to reap the benefits of instant gratification. Systems in the mind make sense of group-level regularities to imagine some internal quality that is present in members of a social category. Other systems in the mind make it possible to entertain social interaction with agents that are not physically present, like dead people, mythical heroes, and gods and spirits. We also entertain partly coherent representations of mass-market economies, because we have templates for social exchange and fairness within small-scale communities. Among all these pieces of information that together produce human behaviors, which are nature and which are culture? No one knows, and it does not matter in the least—in fact no one could find out, because the separation is nowhere.

Thinking that humans have a unified domain of information called culture, and that this domain is separate from the realm of natural things, may be one among those Very Tempting Errors that the philosopher Dan Dennett warns scientists against, adding that one benefit of a liberal education is that we get to learn about all those mistakes, and what made them attractive, as an antidote against further forays down the same intellectual dead-ends.[53] Unfortunately, in the case of the imagined opposition between

nature and culture, the Great Books are of no great help, as most of their authors were blindsided by the misleading intuitions I just described, as were most social scientists before progress in biology and psychology could provide an escape from this tempting error.

Philosophical Crumbs

A condition of scientific progress is to discard what philosophers call the manifest image, a picture of the world that seems both straightforward and self-evident.[54] In the physical world, that means abandoning our view of solid objects in a Euclidian space and replacing them with unintuitive notions of quantum objects. In the natural world, we had to jettison the notion of distinct natural species as essentially different, in order to think in terms of populations and of changing genotype frequencies.

As far as human social and cultural life is concerned, we need to exert a similar distancing effort, away from the manifest image of our social life. The many models and findings mentioned in the previous chapters show that the process is well under way, that we have the rudiments of some properly scientific accounts of (at least) some domains of human behavior. But the process is certainly effortful, many social scientists find it less than altogether compelling, and it may be difficult to explain to a general readership. Why is that?

There are many obstacles on the path to social science. One is that, as I discussed before, some ways of thinking about societies and cultural transmission are strongly influenced by our evolved dispositions. This is probably the case for the spontaneous, and highly contagious notion of culture versus nature. Also, many ways of thinking about human societies, including many efforts on the part of social scientists, are firmly entrenched in our folk sociology, whose expectations are probably an evolved system that makes social life possible, although it is a terrible tool for understanding social life.

Despite these obstacles, the convergence of research programs in many fields, as reported in the previous chapters, demonstrates that understanding human societies the scientific way is possible, even if we have only

the fragments of such an understanding. This is the consequence of changes that occurred in many different disciplines, notably in cognitive psychology, neurosciences, evolutionary biology, and anthropology. The changes did not occur because scientists in these different fields adopted a new philosophy or a new, encompassing research program. Indeed, the social sciences in past centuries were hampered more than helped by manifestos and general philosophical pronouncements. For instance, in the early twentieth century Durkheim and Boas and other influential scholars made it an official tenet of the newly emerging social sciences that what happened in society had little or nothing to do with what biologists and psychologists were investigating. This kind of segregationist posturing persisted well into the century, making it very difficult for social scientists to realize how much they could gain by the integration of disciplines, by taking profit from the extraordinary developments of biology and cognitive sciences.

So, rather than a new philosophy, the scientific approach to human societies is grounded in a set of simple attitudes and healthy habits that are in fact rather natural to empirical scientists in other fields of inquiry. One of these is deliberate eclecticism, a decision to ignore disciplinary boundaries and traditions, so that evolutionary findings can inform history, economic models can be based on neurocognitive foundations, and cross-cultural comparisons on ecology and economics. The other habit is a healthy embrace of reductionism. For a long time, social scientists were horrified at the very notion of reduction, and they would clutch their pearls at the very thought of explaining social phenomena in terms of physiology, evolution, cognition, or ecology. The mere mention of psychological or evolutionary facts in descriptions of culture would, according to that academic version of the one-drop rule, irretrievably pollute the social scientific brew. But, in rejecting that form of reduction, social scientists were rejecting what is the common practice of most empirical scientists. Geologists do not ignore the findings and models of physics, they make constant use of them. The same goes for ecologists with biological findings, and for evolutionary biologists with molecular genetics. It was only recently that social scientists realized that these empirical disciplines were all actually making progress, and that

may have to do with the systematic use of reduction in this sense, promising a vertical integration of different fields and disciplines.[55]

That integration is now happening. There is a great hope in these rudiments of a science that would follow the path originally traced by philosophers, historians, and moralists toward explaining the emergence of societies, a truly unique outcome of evolution by natural selection.