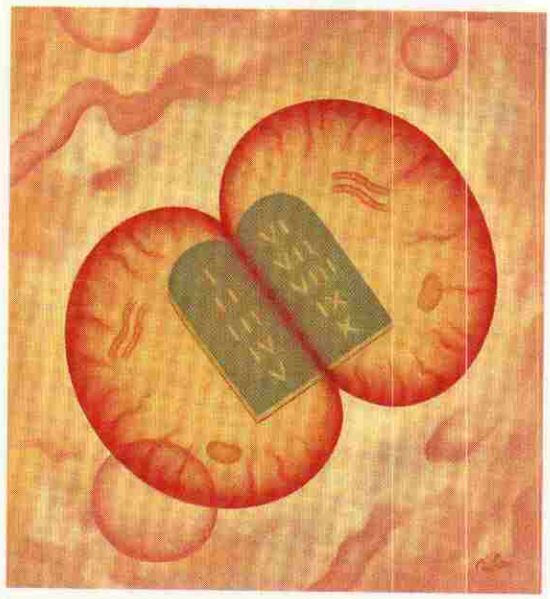
# The Biological Basis of Morality

by EDWARD O. WILSON

*Do we invent our moral absolutes in order to make society workable? Or are these enduring principles expressed to us by some transcendent or Godlike authority? Efforts to resolve this conundrum have perplexed, sometimes inflamed, our best minds for centuries, but the natural sciences are telling us more and more about the choices we make and our reasons for making them*



CENTURIES of debate on the origin of ethics come down to this: Either ethical principles, such as justice and human rights, are independent of human experience, or they are human inventions. The distinction is more than an exercise for academic philosophers. The choice between these two understandings makes all the difference in the way we view ourselves as a species. It measures the authority of religion, and it determines the conduct of moral reasoning.

The two assumptions in competition are like islands in a sea of chaos, as different as life and death, matter and the void. One cannot learn which is correct by pure logic; the answer will eventually be reached through an accumulation of objective evidence. Moral reasoning, I believe, is at every level intrinsically consilient with—compatible with, intertwined with—the natural sciences. (I use a form of the word "consilience"—literally a "jumping together" of knowledge as a result of the linking of facts and fact-based theory across disciplines to create a common groundwork of explanation—because its rarity has preserved its precision.)

Every thoughtful person has an opinion on which premise is correct. But the split is not, as popularly supposed, between religious believers and secularists. It is between transcendentalists, who think that moral guidelines exist outside the human mind, and empiricists, who think them contrivances of the mind. In simplest terms, the options are as follows: *I believe in the independence of moral values, whether from God or not*, and *I believe that moral values come from human beings alone, whether or not God exists.*

Theologians and philosophers have almost always focused on transcendentalism as the means to validate ethics. They seek the grail of natural law, which comprises freestanding principles of moral conduct immune to doubt and compromise. Christian theologians, following Saint Thomas Aquinas's reasoning in *Summa Theologiae*, by and large consider natural law to be an expression of God's will. In this view, human beings have an obligation to discover the law by diligent reasoning and to weave it into the routine of their daily lives. Secular philosophers of a transcendental bent may seem to be radically different from theologians, but they are actually quite similar, at least in moral reasoning. They tend to view natural law as a set of principles so powerful, whatever their origin, as to be self-



Illustrations by Robert Goldstrom

evident to any rational person. In short, transcendental views are fundamentally the same whether God is invoked or not.

For example, when Thomas Jefferson, following John Locke, derived the doctrine of natural rights from natural law, he was more concerned with the power of transcendental statements than with their origin, divine or secular. In the Declaration of Independence he blended secular and religious presumptions in one transcendentalist sentence, thus deftly covering all bets: "We hold these Truths to be self-evident, that all Men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty, and the Pursuit of Happiness." That assertion became the cardinal premise of America's civil religion, the righteous sword wielded by Abraham Lincoln and Martin Luther King Jr., and it endures as the central ethic binding together the diverse peoples of the United States.

So compelling are such fruits of natural-law theory, especially when the Deity is also invoked, that they may seem to place the transcendentalist assumption beyond question. But to its noble successes must be added appalling failures. It has been perverted many times in the past—used, for example, to argue passionately for colonial conquest, slavery, and genocide. Nor was any great war ever fought without each side thinking its cause transcendentally sacred in some manner or other.

So perhaps we need to take empiricism more seriously. In the empiricist view, ethics is conduct favored consistently enough throughout a society to be expressed as a code of principles. It reaches its precise form in each culture according to historical circumstance. The codes, whether adjudged good or evil by outsiders, play an important role in determining which cultures flourish and which decline.

The crux of the empiricist view is its emphasis on objective knowledge. Because the success of an ethical code depends on how wisely it interprets moral sentiments, those who frame one should know how the brain works, and how the mind develops. The success of ethics also depends on how accurately a society can predict the consequences of particular actions as opposed to others, especially in cases of moral ambiguity.

The empiricist argument holds that if we explore the biological roots of moral behavior, and explain their material origins and biases, we should be able to fashion a wise and enduring ethical consensus. The current expansion of scientific inquiry into the deeper processes of human thought makes this venture feasible.

The choice between transcendentalism and empiricism will be the coming century's version of the struggle for men's souls. Moral reasoning will either remain centered in idioms of theology and philosophy, where it is now, or shift toward science-based material analysis. Where it settles will depend on which world view is proved correct, or at least which is more widely *perceived* to be correct.

Ethicists, scholars who specialize in moral reasoning, tend not to declare themselves on the foundations of ethics, or to admit fallibility. Rarely do we see an argument that opens with the simple statement *This is my starting point, and it could be wrong.* Ethicists instead favor a fretful passage from the particular to the ambiguous, or the reverse—vagueness into hard cases. I suspect that almost all are transcendentalists at heart, but they rarely say so in simple declarative sentences. One cannot blame them very much; explaining the ineffable is difficult.

**EACH KIND OF ANIMAL IS GUIDED THROUGH ITS LIFE CYCLE BY UNIQUE AND OFTEN ELABORATE SETS OF INSTINCTUAL ALGORITHMS. WE MAY REASONABLY CONCLUDE THAT HUMAN BEHAVIOR ORIGINATED THE SAME WAY.**

I am an empiricist. On religion I lean toward deism, but consider its proof largely a problem in astrophysics. The existence of a God who created the universe (as envisioned by deism) is possible, and the question may eventually be settled, perhaps by forms of material evidence not yet imagined. Or the matter may be forever beyond human reach. In contrast, and of far greater importance to humanity, the idea of a biological God, one who directs organic evolution and intervenes in human affairs (as envisioned by theism), is increasingly contravened by biology and the brain sciences.

The same evidence, I believe, favors a purely material origin of ethics, and it meets the criterion of consilience: causal explanations of brain activity and evolution, while imperfect, already cover most facts known about behavior we term "moral." Although this conception is relativistic (in other words, dependent on personal viewpoint), it can, if evolved carefully, lead more directly and safely to stable moral codes than can transcendentalism, which is also, when one thinks about it, ultimately relativistic.

Of course, lest I forget, I may be wrong.

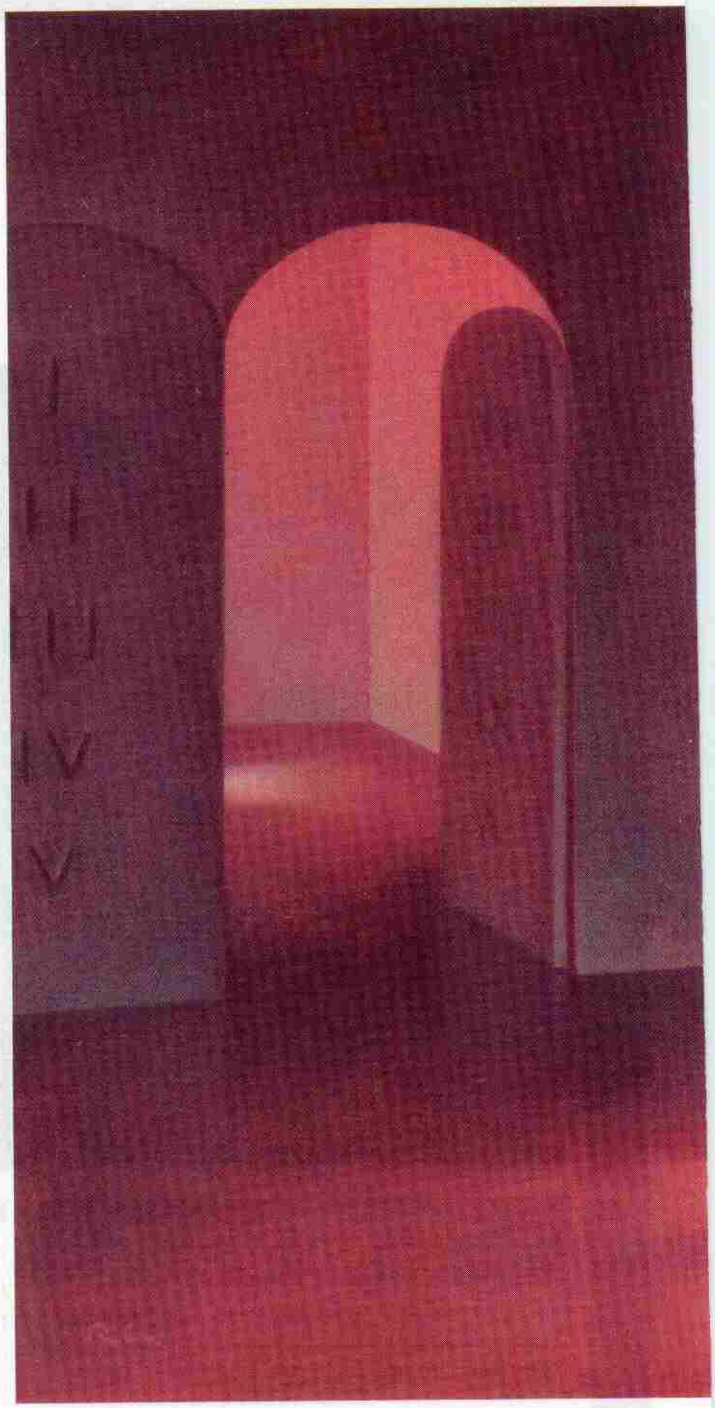
## Transcendentalism Versus Empiricism

THE argument of the empiricist has roots that go back to Aristotle's *Nicomachean Ethics* and, in the beginning of the modern era, to David Hume's *A Treatise of Human Nature* (1739–1740). The first clear evolutionary elaboration of it was by Charles Darwin, in *The Descent of Man* (1871).

Again, religious transcendentalism is bolstered by secular transcendentalism, to which it is fundamentally similar. Immanuel Kant, judged by history the greatest of secular philosophers, addressed moral reasoning very much as a theologian. Human beings, he argued, are independent moral agents with a wholly free will, capable of obeying or breaking moral law: "There is in man a power of self-determination, independent of any coercion through sensuous impulses." Our minds are subject to a categorical imperative, Kant said, of what our actions ought to be. The imperative is a good in itself alone, apart from all other considerations, and it can be recognized by this rule: "Act only on that maxim you wish will become a universal law." Most important, and transcendental, *ought* has no place in nature. Nature, Kant said, is a system of cause and effect, whereas moral choice is a matter of free will, absent cause and effect. In making moral choices, in rising above mere instinct, human beings transcend the realm of nature and enter a realm of freedom that belongs exclusively to them as rational creatures.

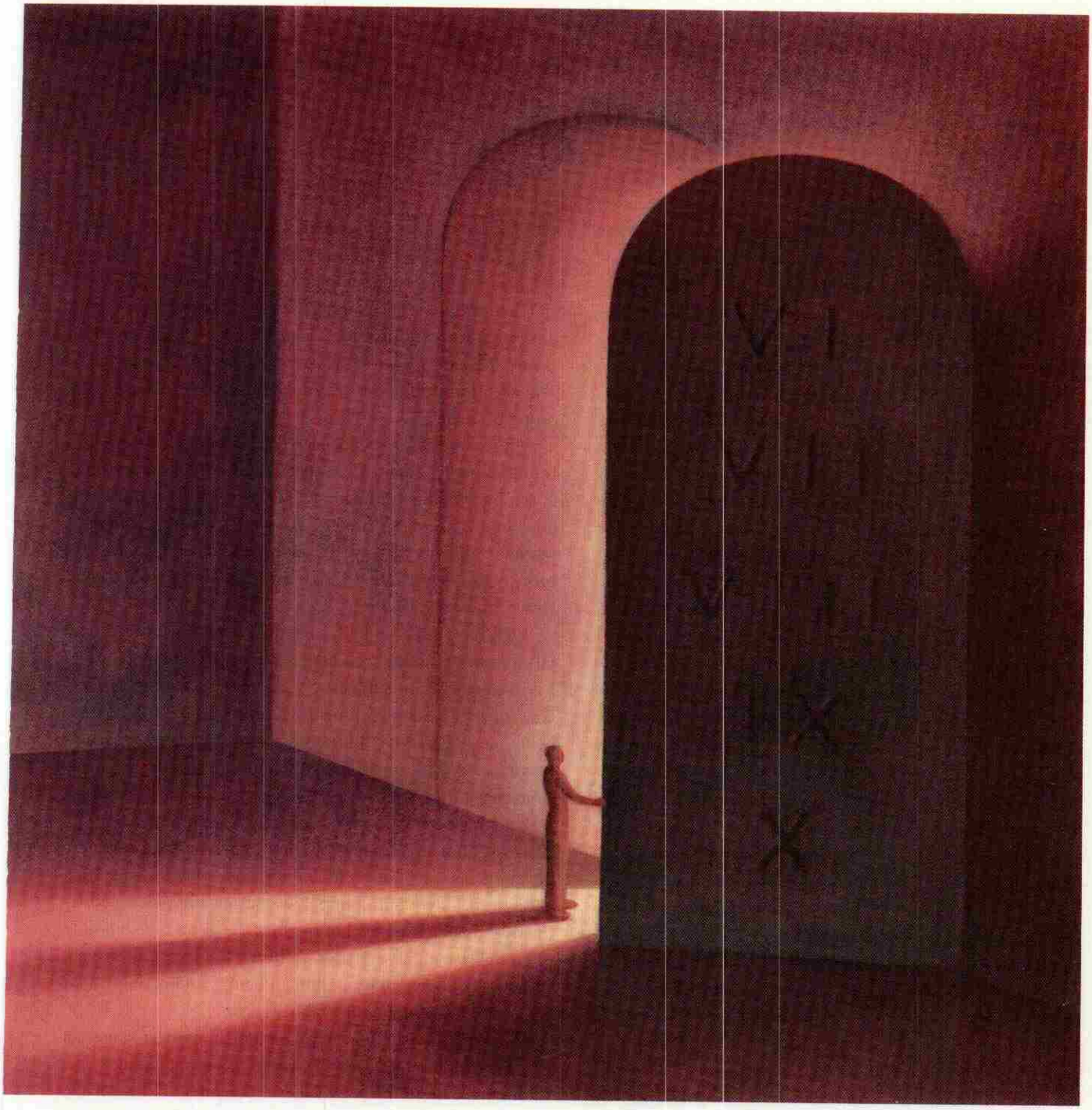
Now, this formulation has a comforting feel to it, but it makes no sense at all in terms of either material or imaginable entities, which is why Kant, even apart from his tortured prose, is so hard to understand. Sometimes a concept is baffling not because it is profound but because it is wrong. This idea does not accord, we know now, with the evidence of how the brain works.

In *Principia Ethica* (1903), G. E. Moore, the founder of modern ethical philosophy, essentially agreed with Kant. In his view, moral reasoning cannot dip into psychology and the social sciences in order to locate ethical principles, because those disciplines yield only a causal picture and fail to illuminate the basis of moral justification. So to reach the normative *ought* by way of the factual *is* is to commit a basic error of logic, which Moore called the naturalistic fallacy. John Rawls, in *A Theory of Justice* (1971), once again traveled the transcendental road. He offered the very plausible suggestion that justice be defined as fairness, which is to be accepted as an intrinsic good. It is the imperative we would follow if we had no starting information about our own future status in life. But in making such a suggestion Rawls ventured no thought on where the human brain comes from or how it works. He offered no evidence that justice-as-fairness is consistent with human nature, hence practicable as a blanket premise. Probably it is, but how can we know except by blind trial and error?



Had Kant, Moore, and Rawls known modern biology and experimental psychology, they might well not have reasoned as they did. Yet as this century closes, transcendentalism remains firm in the hearts not just of religious believers but also of countless scholars in the social sciences and the humanities who, like Moore and Rawls, have chosen to insulate their thinking from the natural sciences.

Many philosophers will respond by saying, Ethicists don't need that kind of information. You really can't pass from *is*



to *ought*. You can't describe a genetic predisposition and suppose that because it is part of human nature, it is somehow transformed into an ethical precept. We must put moral reasoning in a special category, and use transcendental guidelines as required.

No, we do not have to put moral reasoning in a special category and use transcendental premises, because the posing of the naturalistic fallacy is itself a fallacy. For if *ought* is not *is*, what is? To translate *is* into *ought* makes sense if we attend to the objective meaning of ethical precepts. They are very unlikely to be ethereal messages awaiting revelation, or independent truths vibrating in a nonmaterial dimension of the mind. They are more likely to be products of the brain and the culture. From the consilient perspective of the natural sciences, they are no more than principles of the social contract hardened into rules and dictates—the behavioral codes that members of a society fervently wish others to follow and are themselves willing to accept for the common good. Precepts are the extreme on a scale of agreements that range from casual assent, to public sentiment, to law, to that part of the canon considered sacred and unalterable. The scale applied to adultery might read as follows:

*Let's not go further; it doesn't feel right, and it may lead to trouble. (Maybe we ought not.)*

*Adultery not only causes feelings of guilt but is generally disapproved of by society. (We probably ought not.)*

*Adultery isn't just disapproved of; it's against the law. (We almost certainly ought not.)*

*God commands that we avoid this mortal sin. (We absolutely ought not.)*

In transcendental thinking, the chain of causation runs downward from the given *ought* in religion or natural law through jurisprudence to education and finally to individual choice. The argument from transcendentalism takes the following general form: *The order of nature contains supreme principles, either divine or intrinsic, and we will be wise to learn about them and find the means to conform to them.* Thus John Rawls opens *A Theory of Justice* with a proposition he regards as irrevocable: "In a just society the liberties of equal citizenship are taken as settled; the rights secured by justice are not subject to political bargaining or to the calculus of social interests." As many critiques have made clear, that premise can lead to unhappy consequences when applied to the real world, including a tightening of social control and a decline in personal initiative. A very different premise, therefore, is suggested by Robert Nozick in *Anarchy, State, and Utopia* (1974): "Individuals have rights, and there are things no person or group may do to them (without violating their rights). So strong and far-reaching are these rights that they raise the question of what, if anything, the state and its officials may do." Rawls would point us toward egalitarianism regulated by the state, Nozick toward libertarianism in a minimalist state.

The empiricist view, in contrast, searching for an origin of ethical reasoning that can be objectively studied, reverses the chain of causation. The individual is seen as predisposed biologically to make certain choices. Through cultural evolution some of the choices are hardened into precepts, then into laws, and, if the predisposition or coercion is strong enough, into a belief in the command of God or the natural order of the universe. The general empiricist principle takes this form: *Strong innate feeling and historical experience cause certain actions to be preferred; we have experienced them, and have weighed their consequences, and agree to conform with codes that express them. Let us take an oath upon the codes, invest our personal honor in them, and suffer punishment for their violation.* The empiricist view concedes that moral codes are devised to conform to some drives of human nature and to suppress others. *Ought* is the translation not of human nature but of the public will, which can be made increasingly wise and stable through an understanding of the needs and pitfalls of human nature. The empiricist view recognizes that the strength of commitment can wane as a result of new knowledge and experience, with the result that certain rules may be desacralized, old laws rescinded, and formerly prohibited behavior set free. It also recognizes that for the same reason new moral codes may need to be devised, with the potential of being made sacred in time.

## The Origin of Moral Instincts

If the empiricist world view is correct, *ought* is just shorthand for one kind of factual statement, a word that denotes what society first chose (or was coerced) to do, and then codified. The naturalistic fallacy is thereby reduced to the naturalistic problem. The solution of the problem is not difficult: *ought* is the product of a material process. The solution points the way to an objective grasp of the origin of ethics.

A few investigators are now embarked on just such a foundational inquiry. Most agree that ethical codes have arisen by evolution through the interplay of biology and culture. In a sense these investigators are reviving the idea of moral sentiments that was developed in the eighteenth century by the British empiricists Francis Hutcheson, David Hume, and Adam Smith.

What have been thought of as moral sentiments are now taken to mean moral instincts (as defined by the modern behavioral sciences), subject to judgment according to their consequences. Such sentiments are thus derived from epigenetic rules—hereditary biases in mental development, usually conditioned by emotion, that influence concepts and decisions made from them. The primary origin of moral instincts is the dynamic relation between cooperation and defection. The essential ingredient for the molding of the instincts during genetic evolution in any species is intelligence high enough to judge and manipulate the tension generated by the dynamism. That level of intelligence allows the building of complex mental scenarios well into the future. It occurs, so far as is known, only in human beings and perhaps their closest relatives among the higher apes.

A way of envisioning the hypothetical earliest stages of moral evolution is provided by game theory, particularly the solutions to the famous Prisoner's Dilemma. Consider the following typical scenario of the dilemma. Two gang members have been arrested for murder and are being questioned separately. The evidence against them is strong but not irrefutable. The first gang member believes that if he turns state's witness, he will be granted immunity and his partner will be sentenced to life in prison. But he is also aware that his partner has the same option, and that if both of them exercise it, neither will be granted immunity. That is the dilemma. Will the two gang members independently defect, so that both take the hard fall? They will not, because they agreed in advance to remain silent if caught. By doing so, both hope to be convicted on a lesser charge or escape punish-

ment altogether. Criminal gangs have turned this principle of calculation into an ethical precept: Never rat on another member; always be a stand-up guy. Honor does exist among thieves. The gang is a society of sorts; its code is the same as that of a captive soldier in wartime, obliged to give only name, rank, and serial number.

In one form or another, comparable dilemmas that are solvable by cooperation occur constantly and everywhere in daily life. The payoff is variously money, status, power, sex, access, comfort, or health. Most of these proximate rewards are converted into the universal bottom line of Darwinian genetic fitness: greater longevity and a secure, growing family.

And so it has most likely always been. Imagine a Paleolithic band of five hunters. One considers breaking away from the others to look for an antelope on his own. If successful, he will gain a large quantity of meat and hide—five times as much as if he stays with the band and they are successful. But he knows from experience that his chances of success are very low, much less than the chances of the band of five working together. In addition, whether successful alone or not, he will suffer animosity from the others for lessening their prospects. By custom the band members remain together and share equitably the animals they kill. So the hunter stays. He also observes good manners in doing so, especially if he is the one who makes the kill. Boastful pride is condemned, because it rips the delicate web of reciprocity.

Now suppose that human propensities to cooperate or defect are heritable: some people are innately more cooperative, others less so. In this respect moral aptitude would simply be like almost all other mental traits studied to date. Among traits with documented heritability, those closest to moral aptitude are empathy with the distress of others and certain processes of attachment between infants and their caregivers. To the heritability of moral aptitude add the abundant evidence of history that cooperative individuals generally survive longer and leave more offspring. Following that reasoning, in the course of evolutionary history genes predisposing people toward cooperative behavior would have come to predominate in the human population as a whole.

**LITTLE WONDER THAT ETHICS IS THE MOST CONTESTED OF ALL PHILOSOPHICAL ENTERPRISES, OR THAT POLITICAL SCIENCE IS SO PROBLEMATIC. NEITHER IS INFORMED BY AUTHENTIC THEORY IN THE NATURAL SCIENCES.**

Such a process repeated through thousands of generations inevitably gave rise to moral sentiments. With the exception of psychopaths (if any truly exist), every person vividly experiences these instincts variously as conscience, self-respect, remorse, empathy, shame, humility, and moral outrage. They bias cultural evolution toward the conventions that express the universal moral codes of honor, patriotism, altruism, justice, compassion, mercy, and redemption.

The dark side of the inborn propensity to moral behavior is xenophobia. Because personal familiarity and common interest are vital in social transactions, moral sentiments evolved to be selective. People give trust to strangers with effort, and true compassion is a commodity in chronically short supply. Tribes cooperate only through carefully defined treaties and other conventions. They are quick to imagine themselves the victims of conspiracies by competing groups, and they are prone to dehumanize and murder their rivals during periods of severe conflict. They cement their own group loyalties by means of sacred symbols and ceremonies. Their mythologies are filled with epic victories over menacing enemies.

The complementary instincts of morality and tribalism are easily manipulated. Civilization has made them more so. Beginning about 10,000 years ago, a tick in geological time, when the agricultural revolution started in the Middle East, in China, and in Mesoamerica, populations increased tenfold in density over those of hunter-gatherer societies. Families settled on small plots of land, villages proliferated, and labor was finely divided as a growing minority of the populace specialized as craftsmen, traders, and soldiers. The rising agricultural societies became increasingly hierarchical. As chiefdoms and then states thrived on agricultural surpluses, hereditary rulers and priestly castes took power. The old ethical codes were transformed into coercive regulations, always to the advantage of the ruling classes. About this time the idea of law-giving gods originated. Their commands lent the ethical codes overpowering authority—once again, no surprise, in the interests of the rulers.

Because of the technical difficulty of analyzing such phenomena in an objective manner, and because people resist biological explanations of their higher cortical functions in

the first place, very little progress has been made in the biological exploration of the moral sentiments. Even so, it is astonishing that the study of ethics has advanced so little since the nineteenth century. The most distinguishing and vital qualities of the human species remain a blank space on the scientific map. I doubt that discussions of ethics should rest upon the freestanding assumptions of contemporary philosophers who have evidently never given thought to the evolutionary origin and material functioning of the human brain. In no other domain of the humanities is a union with the natural sciences more urgently needed.

When the ethical dimension of human nature is at last fully opened to such exploration, the innate epigenetic rules of moral reasoning will probably not prove to be aggregated into simple instincts such as bonding, cooperativeness, and altruism. Instead the rules will most probably turn out to be an ensemble of many algorithms, whose interlocking activities guide the mind across a landscape of nuanced moods and choices.

Such a prestructured mental world may at first seem too complicated to have been created by autonomous genetic evolution alone. But all the evidence of biology suggests that just this process was enough to spawn the millions of species of life surrounding us. Each kind of animal is furthermore guided through its life cycle by unique and often elaborate sets of instinctual algorithms, many of which are beginning to yield to genetic and neurobiological analyses. With all these examples before us, we may reasonably conclude that human behavior originated the same way.

## A Scientific Approach to Moral Reasoning

MEANWHILE, the mélanges of moral reasoning employed by modern societies are, to put the matter simply, a mess. They are chimeras, composed of odd parts stuck together. Paleolithic egalitarian and tribalistic instincts are still firmly installed. As part of the genetic foundation of human nature, they cannot be replaced. In some cases, such as quick hostility to strangers and compet-

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## WINTER BARN

A light slant snow dragging the fields, a counterwind
where the edges of the barn frayed worlds,

blurred outside in. This is what my love could give me
instead of children—the dusk as presence, moth-like,

and with a moth's dust-colored flickering stall by stall,
some empty now, certain gone to slaughter, driven north

in open trucks over potholed, frozen roads.
Such a hard ride to bloodlet, blankness, the stalls' stone

floors hosed out, yet damp, the urine reek not quite
muffled with fresh hay, trough water still giving
back lantern

light like ponds at nightfall. Sheep lay steaming, cloud
in cloud. The barn cat slept among last summer's
lambs, black

faced, apart, relieved of their mothers. We made our way,
my dogs and I, to say hello to the Yorkshire sow
named Kora, who heaved herself up to greet us,
let the dogs lick her oiled snout smeared with feed

while I scratched her forehead. Kora of the swineherds
fallen with Persephone, perhaps in hell a bride's only company.

Prodigal, planetary, Kora's great-spined, strict-bristled body
wore the black mud of a cold, righteous creation,

burrs and mugwort plastered at the gates.
Days her smell stayed with us. The last time we saw her

the plaque bearing her name was gone. Maybe she
would be mated.
Sparrows sailed the barn's doomed girth, forsaken,

therefore free. They lit on rafters crossing the west windows
that flared at sunset like a furnace fed on stars.

—DEBORAH DIGGES

ing groups, they have become generally ill adapted and persistently dangerous. Above the fundamental instincts rise superstructures of arguments and rules that accommodate the novel institutions created by cultural evolution. These accommodations, which reflect the attempt to maintain order and further tribal interests, have been too volatile to track by genetic evolution; they are not yet in the genes.

Little wonder, then, that ethics is the most publicly contested of all philosophical enterprises. Or that political science, which at its foundation is primarily the study of applied ethics, is so frequently problematic. Neither is informed by anything that would be recognizable as authentic theory in the natural sciences. Both ethics and political science lack a foundation of verifiable knowledge of human nature sufficient to produce cause-and-effect predictions and sound judgments based on them. Surely closer attention must be paid to the deep springs of ethical behavior. The greatest void in knowledge for such a venture is the biology of moral sentiments. In time this subject can be understood, I believe, by paying attention to the following topics:

- *The definition of moral sentiments*, first by precise descriptions from experimental psychology and then by analysis of the underlying neural and endocrine responses.
- *The genetics of moral sentiments*, most easily approached through measurements of the heritability of the psychological and physiological processes of ethical behavior, and eventually, with difficulty, through identification of the prescribing genes.
- *The development of moral sentiments as products of the interactions of genes and the environment*. Research is most effective when conducted at two levels: the histories of ethical systems as part of the emergence of different cultures, and the cognitive development of individuals living in a variety of cultures. Such investigations are already well along in anthropology and psychology. In the future they will be augmented by contributions from biology.
- *The deep history of moral sentiments*—why they exist in the first place. Presumably they contributed to survival and reproductive success during the long periods of prehistoric time in which they genetically evolved.

**SCIENTISTS FROM ANOTHER PLANET WOULD NOTICE IMMEDIATELY THE PARALLELS BETWEEN ANIMAL DOMINANCE BEHAVIOR ON THE ONE HAND AND HUMAN OBEISANCE TO RELIGIOUS AND CIVIL AUTHORITY ON THE OTHER.**

From a convergence of these several approaches the true origin and meaning of ethical behavior may come into focus. If so, a more certain measure can then be taken of the strength and flexibility of the epigenetic rules composing the various moral sentiments. From that knowledge it should be possible to adapt ancient moral sentiments more wisely to the swiftly changing conditions of modern life into which, willy-nilly and largely in ignorance, we have plunged.

Then new answers might be found to the truly important questions of moral reasoning. How can the moral instincts be ranked? Which are best subdued and to what degree? Which should be validated by law and symbol? How can precepts be left open to appeal under extraordinary circumstances? In the new understanding can be located the most effective means for reaching consensus. No one can guess the exact form that agreements will take from one culture to the next. The process, however, can be predicted with assurance. It will be democratic, weakening the clash of rival religions and ideologies. History is moving decisively in that direction, and people are by nature too bright and too contentious to abide anything else. And the pace can be confidently predicted: change will come slowly, across generations, because old beliefs die hard, even when they are demonstrably false.

## The Origins of Religion

THE same reasoning that aligns ethical philosophy with science can also inform the study of religion. Religions are analogous to organisms. They have a life cycle. They are born, they grow, they compete, they reproduce, and, in the fullness of time, most die. In each of these phases religions reflect the human organisms that nourish them. They express a primary rule of human existence: Whatever is necessary to sustain life is also ultimately biological.

Successful religions typically begin as cults, which then increase in power and inclusiveness until they achieve tolerance outside the circle of believers. At the core of each religion is a creation myth, which explains how the world began and how the chosen people—those subscribing to the belief system—arrived at its center. Often a mystery, a set of secret

instructions and formulas, is available to members who have worked their way to a higher state of enlightenment. The medieval Jewish cabala, the trigradal system of Freemasonry, and the carvings on Australian aboriginal spirit sticks are examples of such arcana. Power radiates from the center, gathering converts and binding followers to the group. Sacred places are designated, where the gods can be importuned, rites observed, and miracles witnessed.

The devotees of the religion compete as a tribe with those of other religions. They harshly resist the dismissal of their beliefs by rivals. They venerate self-sacrifice in defense of the religion.

The tribalistic roots of religion are similar to those of moral reasoning and may be identical. Religious rites, such as burial ceremonies, are very old. It appears that in the late Paleolithic period in Europe and the Middle East bodies were sometimes placed in shallow graves, accompanied by ocher or blossoms; one can easily imagine such ceremonies performed to invoke spirits and gods. But, as theoretical deduction and the evidence suggest, the primitive elements of moral behavior are far older than Paleolithic ritual. Religion arose on a foundation of ethics, and it has probably always been used in one manner or another to justify moral codes.

The formidable influence of the religious drive is based on far more, however, than just the validation of morals. A great subterranean river of the mind, it gathers strength from a broad spread of tributary emotions. Foremost among them is the survival instinct. "Fear," as the Roman poet Lucretius said, "was the first thing on earth to make the gods." Our conscious minds hunger for a permanent existence. If we cannot have everlasting life of the body, then absorption into some immortal whole will serve. *Anything* will serve, as long as it gives the individual meaning and somehow stretches into eternity that swift passage of the mind and spirit lamented by Saint Augustine as the short day of time.

The understanding and control of life is another source of religious power. Doctrine draws on the same creative springs as science and the arts, its aim being the extraction of order from the mysteries and tumult of the material world. To explain the meaning of life it spins mythic narratives of the tribal history, populating the cosmos with protective spirits and gods. The existence of the supernatural, if accepted, testifies to the existence of that other world so desperately desired.

Religion is also mightily empowered by its principal ally, tribalism. The shamans and priests implore us, in somber cadence, *Trust in the sacred rituals, become part of the immortal force, you are one of us. As your life unfolds, each step has mystic significance that we who love you will mark with a solemn rite of passage, the last to be performed when you enter that second world, free of pain and fear.*

If the religious mythos did not exist in a culture, it would quickly be invented, and in fact it has been invented everywhere, thousands of times through history. Such inevitability is the mark of instinctual behavior in any species, which is guided toward certain states by emotion-driven rules of mental development. To call religion instinctive is not to suppose that any particular part of its mythos is untrue—only that its sources run deeper than ordinary habit and are in fact hereditary, urged into existence through biases in mental development that are encoded in the genes.

Such biases are a predictable consequence of the brain's genetic evolution. The logic applies to religious behavior, with the added twist of tribalism. There is a hereditary selective advantage to membership in a powerful group united by devout belief and purpose. Even when individuals subordinate themselves and risk death in a common cause, their genes are more likely to be transmitted to the next generation than are those of competing groups who lack comparable resolve.

The mathematical models of population genetics suggest the following rule in the evolutionary origin of such altruism: If the reduction in survival and reproduction of individuals owing to genes for altruism is more than offset by the increased probability of survival of the group owing to the altruism, then altruism genes will rise in frequency throughout the entire population of competing groups. To put it as concisely as possible: the individual pays, his genes and tribe gain, altruism spreads.

## Ethics and Animal Life

LET me now suggest a still deeper significance of the empiricist theory of the origin of ethics and religion. If empiricism were disproved, and transcendentalism compellingly upheld, the discovery would be quite simply the most consequential in human history. That is the burden laid upon biology as it draws close to the humanities.

The matter is still far from resolved. But empiricism, as I have argued, is well supported thus far in the case of ethics. The objective evidence for or against it in religion is weaker, but at least still consistent with biology. For example, the emotions that accompany religious ecstasy clearly have a neurobiological source. At least one form of brain disorder is associated with hyperreligiosity, in which cosmic significance is given to almost everything, including trivial everyday events. One can imagine the biological construction of a mind with religious beliefs, although that alone would not disprove the logic of transcendentalism, or prove the beliefs themselves to be untrue.

Equally important, much if not all religious behavior could have arisen from evolution by natural selection. The theory fits—crudely. The behavior includes at least some aspects of belief in gods. Propitiation and sacrifice, which are near-universals of religious practice, are acts of submis-


sion to a dominant being. They reflect one kind of dominance hierarchy, which is a general trait of organized mammalian societies. Like human beings, animals use elaborate signals to advertise and maintain their rank in the hierarchy. The details vary among species but also have consistent similarities across the board, as the following two examples will illustrate.

In packs of wolves the dominant animal walks erect and "proud," stiff-legged and deliberate, with head, tail, and ears up, and stares freely and casually at others. In the presence of rivals the dominant animal bristles its pelt while curling its lips to show teeth, and it takes first choice in food and space. A subordinate uses opposite signals. It turns away from the dominant individual while lowering its head, ears, and tail, and it keeps its fur sleek and its teeth covered. It grovels and slinks, and yields food and space when challenged.

In a troop of rhesus monkeys the alpha male is remarkably similar in mannerisms to a dominant wolf. He keeps his head and tail up, and walks in a deliberate, "regal" manner while casually staring at others. He climbs objects to maintain height above his rivals. When challenged he

stares hard at the opponent with mouth open—signaling aggression, not surprise—and sometimes slaps the ground with open palms to signal his readiness to attack. The male or female subordinate affects a furtive walk, holding its head and tail down, turning away from the alpha and other higher-ranked individuals. It keeps its mouth shut except for a fear grimace, and when challenged makes a cringing retreat. It yields space and food and, in the case of males, estrous females.

My point is this: Behavioral scientists from another planet would notice immediately the parallels between animal dominance behavior on the one hand and human obeisance to religious and civil authority on the other. They would point out that the most elaborate rites of obeisance are directed at the gods, the hyperdominant if invisible members of the human group. And they would conclude, correctly, that in baseline social behavior, not just in anatomy, *Homo sapiens* has only recently diverged in evolution from a nonhuman primate stock.

Countless studies of animal species, whose instinctive behavior is unobscured by cultural elaboration, have shown that membership in dominance orders pays off in survival and lifetime reproductive success. That is true not just for the dominant individuals but for the subordinates as well. Membership in either class gives animals better protection against enemies and better access to food, shelter, and mates than does solitary existence. Furthermore, subordination in the group is not necessarily permanent. Dominant individuals weaken and die, and as a result some of the underlings advance in rank and appropriate more resources.

Modern human beings are unlikely to have erased the old mammalian genetic programs and devised other means of distributing power. All the evidence suggests that they have not. True to their primate heritage, people are easily seduced by confident, charismatic leaders, especially males. That predisposition is strong in religious organizations. Cults form around such leaders. Their power grows if they can persuasively claim special access to the supremely dominant, typically male figure of God. As cults evolve into religions, the image of the Supreme Being is reinforced by myth and liturgy. In time the authority of the founders and their successors is graven in sacred texts. Unruly subordinates, known as "blasphemers," are squashed.

The symbol-forming human mind, however, never remains satisfied with raw, apish feeling in any emotional realm. It strives to build cultures that are maximally rewarding in every dimension. Ritual and prayer permit religious believers to be in direct touch with the Supreme Being; consolation from coreligionists softens otherwise unbearable grief; the unexplainable is explained; and an oceanic sense of communion with the larger whole is made possible.

Communion is the key, and hope rising from it is eternal; out of the dark night of the soul arises the prospect of a spiritual journey to the light. For a special few the journey can be taken in this life. The mind reflects in certain ways in order to reach ever higher levels of enlightenment, until finally, when no further progress is possible, it enters a mystical union with the whole. Within the great religions such enlightenment is expressed by Hindu samadhi, Buddhist Zen satori, Sufi fana, and Pentecostal Christian rebirth. Something like it is also experienced by hallucinating preliterate shamans. What all these celebrants evidently feel (as I felt once, to some degree, as a reborn evangelical) is hard to put in words, but Willa Cather came as close as possible in a single sentence. In *My*

*Antonia* her fictional narrator says, "That is happiness; to be dissolved into something complete and great."

Of course that is happiness—to find the godhead, or to enter the wholeness of nature, or otherwise to grasp and hold on to something ineffable, beautiful, and eternal. Millions seek it. They feel otherwise lost, adrift in a life without ultimate meaning. They enter established religions, succumb to cults, dabble in New Age nostrums. They push *The Celestine Prophecy* and other junk attempts at enlightenment onto the best-seller lists.

Perhaps, as I believe, these phenomena can all eventually be explained as functions of brain circuitry and deep genetic history. But this is not a subject that even the most hardened empiricist should presume to trivialize. The idea of mystical union is an authentic part of the human spirit. It has occupied humanity for millennia, and it raises questions of utmost seriousness for transcendentalists and scientists alike. What road, we ask, was traveled, what destination reached, by the mystics of history?

## Theology Moves Toward Abstraction

FOR many, the urge to believe in transcendental existence and immortality is overpowering. Transcendentalism, especially when reinforced by religious faith, is psychically full and rich; it feels somehow *right*. By comparison, empiricism seems sterile and inadequate. In the quest for ultimate meaning the transcendentalist route is much easier to follow. That is why, even as empiricism is winning the mind, transcendentalism continues to win the heart. Science has always defeated religious dogma point by point when differences between the two were meticulously assessed. But to no avail. In the United States 16 million people belong to the Southern Baptist denomination, the largest favoring a literal interpretation of the Christian Bible, but the American Humanist Association, the leading organization devoted to secular and deistic humanism, has only 5,000 members.

Still, if history and science have taught us anything, it is that passion and desire are not the same as truth. The human mind evolved to believe in gods. It did not evolve to believe in biology. Acceptance of the supernatural conveyed a great advantage throughout prehistory, when the brain was evolving. Thus it is in sharp contrast to the science of biology, which was developed as a product of the modern age and is not underwritten by genetic algorithms. The uncomfortable truth is that the two beliefs are not factually compatible. As a result, those who hunger for both intellectual and religious truth face disquieting choices.

Meanwhile, theology tries to resolve the dilemma by evolving, sciencelike, toward abstraction. The gods of our ancestors were divine human beings. The Egyptians represented them as Egyptian (often with body parts of Nilotic animals), and the Greeks represented them as Greek. The great contribution of the Hebrews was to combine the entire pantheon into a single person, Yahweh (a patriarch appropriate to desert tribes), and to intellectualize his existence. No graven images were allowed. In the process, they rendered the divine presence less tangible. And so in biblical accounts it came to pass that no one, not even Moses approaching Yahweh in the burning bush, could look upon his face. In time the Jews were prohibited from even pronouncing his true full name. Nevertheless, the idea of a theistic God, omniscient, omnipotent, and closely involved in human affairs, has persisted to this day as the dominant religious image of Western culture.

During the Enlightenment a growing number of liberal Judeo-Christian theologians, wishing to accommodate theism to a more rationalist view of the material world, moved away from God as a literal person. Baruch Spinoza, the preeminent Jewish philosopher of the seventeenth century, visualized the deity as a transcendent substance present everywhere in the universe. *Deus sive natura*, "God or nature," he declared, they are interchangeable. For his philosophical pains he was banished from his synagogue under a comprehensive anathema, combining all the curses in the book. The risk of heresy notwithstanding, the depersonalization of God has continued steadily into the modern era. For Paul Tillich, one of the most influential Protestant theologians of the twentieth century, the assertion of the existence of God-as-person is not false; it is just meaningless. Among many of the most liberal contemporary thinkers the denial of a concrete divinity takes the form of "process theology." Everything in this most extreme of ontologies is part of a seamless and endlessly complex web of unfolding relationships. God is manifest in everything.

Scientists, the roving scouts of the empiricist movement, are not immune to the idea of God. Those who favor it often lean toward some form of process theology. They ask this question: When the real world of space, time, and matter is well enough known, will that knowledge reveal the Creator's presence? Their hopes are vested in the theoretical physicists who pursue the final theory, the Theory of Everything, T.O.E., a system of interlocking equations that describe all that can be learned of the forces of the physical universe. T.O.E. is a "beautiful" theory, as Steven Weinberg has called it in his important book *Dreams of a Final Theory*—beautiful because it will be elegant, expressing the possibility of unending complexity with minimal laws; and symmetrical, because it will hold invariant through all space and time; and inevitable, meaning that once it is stated, no part can be changed without invalidating the whole. All surviving subtheories can be fitted into it permanently, in the manner described by Einstein in his own contribution, the General Theory of Relativity. "The chief attraction of the theory," Ein-

stein said, "lies in its logical completeness. If a single one of the conclusions drawn from it proves wrong, it must be given up; to modify it without destroying the whole structure seems to be impossible."

The prospect of a final theory by the most mathematical of scientists might seem to signal the approach of a new religious awakening. Stephen Hawking, yielding to the temptation in *A Brief History of Time* (1988), declared that this scientific achievement "would be the ultimate triumph of human reason—for then we would know the mind of God."

## A Hunger for Spirituality

THE essence of humanity's spiritual dilemma is that we evolved genetically to accept one truth and discovered another. Can we find a way to erase the dilemma, to resolve the contradictions between the transcendentalist and empiricist world views?

Unfortunately, in my view, the answer is no. Furthermore, the choice between the two is unlikely to remain arbitrary forever. The assumptions underlying these world views are being tested with increasing severity by cumulative verifiable knowledge about how the universe works, from atom to brain to galaxy. In addition, the harsh lessons of history have taught us that one code of ethics is not always as good—or at least not as durable—as another. The same is true of religions. Some cosmologies are factually less correct than others, and some ethical precepts are less workable.

Human nature is biologically based, and it is relevant to ethics and religion. The evidence shows that because of its influence, people can readily be educated to only a narrow range of ethical precepts. They flourish within certain belief systems and wither in others. We need to know exactly why.

To that end I will be so presumptuous as to suggest how the conflict between the world views will most likely be settled. The idea of a genetic, evolutionary origin of moral and religious beliefs will continue to be tested by biological studies of complex human behavior. To the extent that the sensory and nervous systems appear to have evolved by natural selection, or at least some other purely material process, the empiricist interpretation will be supported. It will be further supported by verification of gene-culture coevolution, the essential process postulated by scientists to underlie human nature by linking changes in genes to changes in culture.

Now consider the alternative. To the extent that ethical and religious phenomena do *not* appear to have evolved in a manner congenial to biology, and especially to the extent that such complex behavior cannot be linked to physical events in the sensory and nervous systems, the empiricist position will have to be abandoned and a transcendentalist explanation accepted.

For centuries the writ of empiricism has been spreading into the ancient domain of transcendentalist belief, slowly at the start but quickening in the scientific age. The spirits our ancestors knew intimately fled first the rocks and trees and then the distant mountains. Now they are in the stars, where their final extinction is possible. *But we cannot live without them.* People need a sacred narrative. They must have a sense of larger purpose, in one form or another, however intellectualized. They will refuse to yield to the despair of animal mortality. They will continue to plead, in company with the psalmist, *Now Lord, what is my comfort?* They will find a way to keep the ancestral spirits alive.

If the sacred narrative cannot be in the form of a religious cosmology, it will be taken from the material history of the universe and the human species. That trend is in no way debasing. The true evolutionary epic, retold as poetry, is as intrinsically ennobling as any religious epic. Material reality discovered by science already possesses more content and grandeur than all religious cosmologies combined. The continuity of the human line has been traced through a period of deep history a thousand times as old as that conceived by the Western religions. Its study has brought new revelations of great moral importance. It has made us realize that *Homo sapiens* is far more than an assortment of tribes and races. We are a single gene pool from which individuals are drawn in each generation and into which they are dissolved the next generation, forever united as a species by heritage and a common future. Such are the conceptions, based on fact, from which new intimations of immortality can be drawn and a new mythos evolved.

Which world view prevails, religious transcendentalism or scientific empiricism, will make a great difference in the way humanity claims the future. While the matter is under advisement, an accommodation can be reached if the following overriding facts are realized. Ethics and religion are still too complex for present-day science to explain in depth. They are, however, far more a product of autonomous evolution than has hitherto been conceded by most theologians. Science faces in ethics and religion its most interesting and possibly most humbling challenge, while religion must somehow find the way to incorporate the discoveries of science in order to retain credibility. Religion will possess strength to the extent that it codifies and puts into enduring, poetic form the highest values of humanity consistent with empirical knowledge. That is the only way to provide compelling moral leadership. Blind faith, no matter how passionately expressed, will not suffice. Science, for its part, will test relentlessly every assumption about the human condition and in time uncover the bedrock of moral and religious sentiments.

The eventual result of the competition between the two world views, I believe, will be the secularization of the human epic and of religion itself. However the process plays out, it demands open discussion and unwavering intellectual rigor in an atmosphere of mutual respect.