

Chapter 6

Religion: Naturalized, Socialized, Evaluated

Since there isn't any religion in nature, it may be difficult to naturalize it even harder than with ethics, where there is animal reciprocal cooperation as a precursor. Religion is without antecedents in wild nature. Still, the capacity in persons to be religious somehow evolved within, or emerged out of, natural systems, where before there was no such capacity. Religion too, like ethics and science, is eminent in the human genius. Human societies, historically, always produce religion. Again, there must be some story to tell – this time of the genesis of religion. Now too, however, one must assess such accounts of the genesis of religion as these are set alongside religious accounts of the genesis of nature and culture, analogously to the way one needs an account of the genesis, in culture, of science, set alongside science's account of such genesis of nature and culture.

One should be wary. The question is of the logic as well as of the origin of religion. Religion today may be something quite different from what earlier religion and its precursors initially were. The monotheism widespread in the West, which has interacted with science for several centuries, is quite different from aboriginal animisms. The many religions may not have common origins or any common logic; their origins and operations may differ. Most of what the earliest humans thought is lost in the mists of the past; any psychoprehistory is speculative. One would commit the genetic fallacy if one overlooked ways that religions have matured, reformed, and transformed over the millennia of cumulative and critical transmissible cultures. Religions change, as much as does science. We know much more about what religion now is, and, failing knowledge of the routes traveled in the remote past, it could be a mistake to be so sure we know the determinants along the way.

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Still, origins contribute to explanations in a deeply historical world. In evaluating religious accounts of origins, we will be wiser if we can discover how humans came to be religious, especially since religious capacities are a unique mark of *Homo sapiens*. Two questions are entwined: Is there a plausible religious account of genes and their genesis? Is there a plausible account of the genesis of religion, relating its origin to genes? Neither account will be by way of implication, whether deductive or inductive. There are no covering laws (such as natural selection) plus initial conditions (such as primates) from which one can infer religion (persons who are priests), any more than one can assume microbes as a premise and deduce primates in conclusion. Perhaps we cannot even predict what universal religions in advanced societies will be like, if we know what early religions in simple societies were. That development too may be more historical or culturally contingent than logically or biologically necessary.

The best explanation available will be a "how-possibly" explanation, not a "why-necessarily" explanation (Hempel 1965, p. 428); that is, it will trace a pathway along which religion might have appeared. It will also be true that there appears on Earth later on something, religion, of which there was exactly none before. Ideas may also appear within later religions that have little or no precedent in previous religions. Religious experience transforms animal experience of the environment. Experience of nature takes on a dimension of depth, the experience of the sacred. Nature becomes sacramental, as also do events in culture. This could be illusory mythology that is successfully functional. It could be an epiphenomenal anomaly, like dreams that have little to do with the real world. But it might be, like science and ethics, the achievement of new levels of insight. The fact that our perceptual and conceptual faculties have evolved does not mean that nothing true appears in them, nor that nothing new can ever appear in them.

Although origins contribute to understanding, the genesis of religion, unique to humans, is unlikely to be something one can extrapolate from earlier explanations in biology. A good rule facing the future is to stick with explanations previously tested; the sun will rise tomorrow because it rose yesterday and yesteryear. One will be right almost all the time, for the future is regularly like the past. One will be wrong every time the event under consideration is an advent making a critical difference introducing what is genuinely novel. One

will miss every occasion of originating genesis. All one's explanations will be anachronistic. In the continuing creation, the future is never like the past: life appeared where none was before, exoskeletons and endoskeletons arose, photosynthesis evolved, so did sexuality and warm blood. So did vertebrates, sentience, pain, hiding, smelling, alarm calls, courting of mates, aggressive displays, learned behavior. So did fire building, tool making, language, writing, money, internal combustion engines, computers, rockets. So did ethics, science. And religion. What are we to make of sacrifice, prayer, altars, sacraments, cultus, shamans, priests, prophets, saviors, preachers?

It is tempting to dismiss novel appearances at first as "apparent" anomalies, because lawlike explanation dislikes counterexamples that defy the law. Some way is found by which these are "nothing but" appearances, and the old account, extrapolated, holds despite appearances. But when the appearances continue to mount, the law diminishes in its logical appeal. The developing appearances, the anomalies, are sometimes recompounded into history. When religion appears, can one subsume it under yesterday's explanatory categories? Or is this a deepening of the plot?

1. THE DIVINE EPIC OF LIFE

Religion is generated confronting nature – the sunset, the midnight sky, the wind and the rain, the forest primeval, birth and death, life renewed in the midst of its perpetual perishing. Though religion arises only within human societies and notably helps humans to manage within such societies, coupling neighbors and God, it will not suffice to get religion socialized (Sections 2, 3, and 4). One must also get religion naturalized, not so much in the sense of explaining it (away) naturalistically, as of explaining the numinous encounter with manifest nature. Biology does generate religion: the phenomenon of life evokes a religious response whether or not a functional human society is at issue, whether or not one is being altruistic or evangelistic toward others. Nature is the first mystery to be encountered, and society comes later, much later, after one learns evolutionary history. Surveying paleontological history, Loren Eiseley exclaims, "Nature itself is one vast miracle transcending the reality of night and nothingness" (1960, p. 171).

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Religion begins also in physics and chemistry, matter and energy; in cosmology. Why is there something rather than nothing? Why is there something of a kind that spins this surprising kind of universe? But the most startling results are on Earth, not in the heavens. Our native-range life world stands about midway between the infinitesimal and the immense on the natural scale. The size of a planet is near the geometric mean of the size of the known universe and the size of the atom. The mass of a human being is the geometric mean of the mass of Earth and the mass of a proton. Astronomical nature and micronature, profound as they are, are nature in the simple. At both ends of the spectrum of size, nature lacks the complexity that it demonstrates at the mesolevels, found in Earthen ecosystems, or at psychological levels in human persons in their societies. Humans do not live at the range of the infinitely small, nor at that of the infinitely large, but we may well live at the range of the infinitely complex.

There is in a typical handful of humus, which may have ten billion organisms in it, a richness of structure, a volume of information (trillions of "bits"), resulting from evolutionary processes across a billion years of history, greatly advanced over anything in myriad galaxies, or even, so far as we know, in all of them. The human being is the most sophisticated of known natural products. In our hundred and fifty pounds of protoplasm, in our three pounds of brain, there may be more operational organization than in the whole of the Andromeda galaxy. The number of possible associations among the trillion neurons of a human brain, where each cell can "talk" to as many as a thousand other cells, may exceed the number of atoms in the universe. On a gross cosmic scale, Earth is insignificant and humans are minuscule atoms. But on scales of prolific genesis, Earth is quite significant, and mind is a most impressive creation. The brain is so curiously a microcosm of this macrocosm, since the mind can contain so much of nature within thought and thus mirror the world. We might live at the center of the most genesis.

As far as we can gain it, we, who have such minds, need a unified account, one that narrates the whole Earth story and locates ourselves in it. Call such worldviews "myths" if you wish; they must now be couched in scientific mythology; afterward one can see whether such accounts of the genesis that has taken place here remain congenial to any of the classical religious myths.

(1) The Prolific Earth

One thing is right about the fertility hypothesis as the key to understanding life: humans reside on a fertile Earth. Evolutionary history has been fruitful, prolific. This is no myth; it is among the best established facts. But what hypothesis best explains this fact? From the dawn of religious impulses, in the only animal capable of such reflection, this vitality has been experienced as sacred. Such experience has been often fragmentary and confused, as has every other form of knowledge that humans have struggled to gain, but at its core this insight developed that religion was about an abundant life, about life in its abundance. Classical monotheism developed (evolved) into a fertile (widely reproducing) hypothesis that claims – to take the Hebrew form of it – that the divine Spirit, Wind (Greek: *pneuma*), breathes the breath of life into the dust of the Earth and animates it to generate swarms of living beings (Genesis 2.7). Eastern forms can be significantly different – *maya* spun over Brahman, or *samsara* over *sunyata* – but they too detect the sacred in, with, and under the profuse phenomena.

In that sense, the fact that religious conviction cherishes, conserves, and celebrates this fertility is no reason to think religion suspect; to the contrary, it is reason to think it profound. If this be animal faith, we still need to ask whether the animal in which such faith emerges, *Homo sapiens*, is coping now because it is detecting the truth: there is a divine will for life to continue. Genes and their genesis do lie behind the genesis of religion – but not (we will be claiming) in the way typically alleged by behavioral psychologists and sociobiologists. Rather, the genesis in natural history, when humans discover and reflect over this, generates religious responses. "Fertility" is precisely what evokes religious belief. The prolific Earthen "fertility," "fecundity," or generative capacity is what most needs to be explained in the spectacular display of life in which we find ourselves immersed.

"Fertility" is literally used of the fauna and flora, though perhaps we are metaphorically extending it to evolutionary ecosystems and the global biosphere. "Nature" (we recall) has, as root idea, "giving birth." If we must use metaphors, after Darwin, the Earth is as much like a womb in these gestating powers as it is, after Newton, a clockwork machine, or, after Einstein, energy and matter bubbling up out of a space-time matrix. The genesis is widely distributed over the planetary

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space and long continuing over evolutionary time, evidenced by the biodiversity so well documented in the biological sciences.

This genesis is hard fact. No one doubts that these myriad species, including *Homo sapiens*, are here. No one doubts that there lies behind us some sort of genesis, and few readers of this book doubt that evolutionary natural history is a key to this genesis. But a self-generating nature is not self-explanatory. One needs an account of the setup, an account of the generating processes; of how possibilities get actualized, of how possibility spaces come to be; of the depth sources of the creativity. In this genesis, "more" regularly comes from "less." Something comes, if not from nothing, at least where nothing like that was present before. Information does appear, superimposed on matter and energy, a key to the vital generation of life. This is a pregnant Earth. But we know what pregnant means with females giving birth, the vital information transferred in DNA from one generation to the next, and we must puzzle over where and how such information originates on Earth (Section 5[2]).

Such hard fact is hard to explain without some sort of generative principles before which many persons are inclined, one way or another, to become religious. Ernst Mayr, one of the most eminent living biologists, concludes, "Virtually all biologists are religious, in the deeper sense of the word, even though it may be a religion without revelation. . . . The unknown and maybe unknowable instills in us a sense of humility and awe" (1982, p. 81). We detect something sublime in the awe-inspiring sense because there is something sublime in the etymological sense of that word, something that takes us to the limits of our understanding, and mysteriously beyond.

Viewing Earthrise from the moon, the astronaut Edgar Mitchell was entranced:

Suddenly from behind the rim of the moon, in long, slow-motion moments of immense majesty, there emerges a sparkling blue and white jewel, a light, delicate sky-blue sphere laced with slowly swirling veils of white, rising gradually like a small pearl in a duck sea of black mystery. It takes more than a moment to fully realize this is Earth. . . home. (Kelley 1988, at photographs 42-45)

The astronaut Michael Collins recalled being Earth-struck:

The more we see of other planets, the better this one looks. When I traveled to the Moon, it wasn't my proximity to that battered

rockpile I remember so vividly, but rather what I saw when I looked back at my fragile home – a glistening, inviting beacon, delicate blue and white, a tiny outpost suspended in the black infinity. Earth is to be treasured and nurtured, something precious that *must* endure. (1980, p. 6)

Ernst Mayr's thoughtful biologist not only has religious humility, but a respect for nature. "And if one is a truly thinking biologist, one has a feeling of responsibility for nature, as reflected by much of the conservation movement" (1985b, p. 60).

The Earth is a pearl in a sea of black mystery. That is metaphor, but metaphor witnessing to the eventful genesis on Earth and witnessing to the power of such genesis, when scientifically known, to generate convictions of value present, to generate religious wonder. Whatever may be said of the rest of the universe, Earth is a prolific place, a pro-life place. That is the testimony of science, as well as a religious conviction. To use a weighted term, the *telos*, ending, heading, of the Earth process is "fertility," generativity, as evidenced in the *telos* (lives defended as ends-in-themselves) of the organisms that are its myriad products. Say if you like that there is a bias for self-organizing or autopoiesis in the process (Kauffman 1993; 1995; Maturana and Varela 1980) that explains the remarkable results. That may be good science, but now we are in a religious or metaphysical mode and need to explain this remarkable bias. Nature has been generously fertile.

(2) Nature and Spirit (*Geist*)

The story is nowhere more fantastic than in the evolution of spirit within and out of nature. Molecules, trillions of them, spin round in complicated ways and generate the unified, focused experience of mind. This too is among the established facts. For this appearance of "genius" (Latin: spirit) scientists can, as yet, hardly imagine a theory, though if ever such a theory appears, we shall welcome it as the most ingenious theory of all. Meanwhile, putting together molecular parts does not really explain how inwardness comes out of outwardness, how felt experience arises where before there was none.

At this point scientists, no less than religious persons, believe what they do not understand: that the output exceeds the input, that the results outrun the causes, that there evolves, incrementally and yet

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ex nihilo too, something in kind (subjects) where, if one looks rearward far enough, nothing of that kind existed before among the Earth objects. The human Geist is especially fertile in its generation of cumulative transmissible cultures, something novel in kind again, now in only one species, for, if one looks rearward in any of the other several billion species over evolutionary time, there is nothing of this kind. Persons too are among the established facts with which we must deal. There is personal narrative as an ego travels through the world.

The real surprise is that the human intelligence can be religious and philosophical; we nowhere approach that elsewhere in animal life. That is why it is so hard to get religion naturalized; it is quite unprecedented. Human spirits have *Existenz*. They anticipate death; they sense their finitude. They face the limit questions, sense the sacred, worry about communion with the ultimate or atonement of their sins. They know guilt, forgiveness, shame, remorse, glory, pride. They suffer angst and alienation. They build symbols with which they interpret their place and role in their world. They create ideologies, affirm creeds, and debate them. They are capable of faith and need salvation. They worship God. All of this is summed up in the one word: "spirit" (*Geist*).

Out of physical premises one derives biological conclusions, and, taking these as premises in turn, one derives psychological conclusions, which, recompounded again, yield spiritual conclusions. This kind of logic seems more story than argument; the form of argument is not so much rational as, to use a religious word, incarnational, since each step has to be embodied. Story is a better category than unfolding law, much less random drift, or selfish defense of life, when one wants to get more out of less. If one tries to interpret the world as law plus initial conditions, there is little plot. If one tries to interpret the world as statistical probabilities, there is little story. But when we tell the story of suffering through to something higher, over the millennia of microbes, and trilobites, dinosaurs and primates, persons who are scientists and saints, we have enough bite for a dramatic story.

(3) Nature and Sin

Humans forge their cultural history beyond biology, but this is not particularly to praise humans and belittle beasts. Part of the human

genius is the genesis of sin. Humans have a superiority of opportunity, capacities unattained in animal life. Alas, however, the human capacity is but brokenly attained. Much of the history that humans have made is checkered enough. There are noble achievements, but humans repeatedly stand condemned because they could and ought to have made for themselves better history than they did. Religion has tried to face this fact full on, cognitively, existentially, and redemptively. All classical religions find the human condition to be deeply flawed; humans need salvation. "Our civilizations were jerrybuilt around the [human] biogram," Wilson laments (1975a, p. 548). But to discover that the world is in a troubled condition is no new revelation to religious sages; to the contrary, it is what they have regularly taught. In Judeo-Christian monotheism, the central category is that of "sin," missing the mark; in Eastern faiths the category is that of "ignorance," *avidya*. Islam uses both evaluations.

There is something "original" about sin, something in human origins that produces sin perennially, something in human biology, in the flesh, that makes it inevitable for humans to lapse into sin. At this point biology and theology are well within dialogue; indeed they can seem to be saying almost the same thing. The innate biological "selfishness" concurs with what classical religions have been teaching for millennia. But this congruence of biology and religion will have to be interpreted with some care.

Humans do have to break out of their animal nature. When animals act "like beasts," as nonmoral beings, nothing is amiss. To the contrary, spectacular values have been achieved over the evolutionary millennia. But if humans go no further, something is amiss; indeed, in theological terms, something is ungodly. They "fall" into evil, rather than rise to their destiny. This is not because their animal nature is selfish; the word "selfish" does not apply where there are no moral agents. Rather, trying to become human without emergence from the animal nature results in selfishness. That stagnates in animal nature. "The natural man [who] does not receive the gifts of the Spirit of God" (1 Corinthians 2.14) is not so much "fallen," as nonrisen, failing rather than falling, languishing in animal nature and falling away from his humane, godly ideal. That is the story parable of Genesis 1-3, a story that is both once upon a time, and once upon all times, aboriginal and perennial, the situation into which humans are now born, which also discloses the ancient past. That is the prologue, sketched mythically, and profoundly orienting

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the whole story of salvation to follow. What was and is in the animals a good thing becomes ("falls into") a bad thing when it is the only thing in human life. This arrests advancement to the next, the human, humane stage.

Is our genetic inheritance the source of the problem? Genetic processes conserve value, but they are, or ought to be, here surpassed. The impulses that give rise to sin (such as those for self-defense) are inherited, though they are not, biologically speaking, a defect in nonhuman lives, or even in human lives, unless and until the options for higher defenses of value arrive, behavioral possibilities, freedoms, from which humans do defect. Human cultural inheritance requires experiences super-to-the-genetic, super-to-the-natural, that is, beyond the previous attainment and power of biology. Those experiences come creatively, with struggle, with an arduous passage through a twilight zone of spirit in exodus from nature. This does not mean that nature is bad; nature is pronounced to be very good – not perfect, because culture is yet to come – but intrinsically good. Humans are made godward, to turn toward God, but shrink back and act like beasts. Genesis is the story not of the fall from perfection, but of the "fall" of the aboriginal couple from innocence into sin and of their awakening into this state. After the sin, "the eyes of both were opened, and they knew that they were naked" (Genesis 3.7).

The aboriginal couple, symbols of us all, rise out of innocence into the world of moral choice, which brings growth into responsibility, imaging God, but also, inevitably, falling into sin, as shown in Cain's killing of Abel and in the subsequent Genesis stories of the worsening human condition. Killing is not new in the world; primates have killed each other for millennia in the defense of their genetic lines. But murder is new in the world; the human has risen to an option to do otherwise and therefore ought to do otherwise. The murderer fails, falls back; his opportunity for humanity is now broken, and his society falls under a curse. The Earth cries out for justice. Society becomes a confused chaos, a babel.

Self-actualizing is a good thing for humans as well as animals. Self-interest is godly; the commandment, we remember, is to love others *as we do ourselves*. The garden is full of trees to eat; we pray for our daily bread. But concupiscence, the desire to possess and enjoy inordinately, is *not* a fitting form of life in the world. Natural selection does favor the "self-serving" individual, and there is no

reason to deplore this process. The fauna and flora are checked in this possessive impulse by the limitations of their ecosystems – which provide a satisfactory place, a niche, for each specific form of life, but limit each species to its appropriate sector, where it has adapted fit. The human species is not so checked, but tempted by the fearful power of hand and mind to possess the whole. The human species has no natural niche, no limits by natural selection, that is relaxed progressively as the human species rises to culture as its niche, superposed on nature.

What religion warns, past the ethical aspirations (of Chapter 5), past the scientific aspirations (in Chapter 4), in critique of culture (Chapter 3), is that ethics and science, like all cultural activities, religion included, will be warped by human ambiguity, by the evil that besets their loftiest aspirations toward the good. Both morality and rationality, unredeemed from self-love, will prove dysfunctional and tragic. Both science and ethics need to be redeemed. Here the value crisis is taken to a new level. Symbolically put, those who wish themselves to be God fail tragically; those who wish to image God can become children of God, though made of the dust of Earth. The dusty beast reaches to be god; that is biology gone amok, the original sin.

In the Buddhist version of this story, our inordinate thirsts (*tanha*) make the world unsatisfactory (*dukkha*), and humans can be released only by enlightenment that transcends the self (*anatta*). In the Hindu version, human ignorance (*avidya*) mistakes the empirical self (*jiva*) for the true self (*atman*) and misses the universal (*Brahman*). There are important differences with the Hebrew-Christian vision, beyond our scope here. Meanwhile, each in its own way inhibits the genetically transmitted animal drives so that the cultural transmission checks and humanizes the genetic one. Genes may make one selfish, but it is not genes that make one Christian, Buddhist, Hindu, or religiously Jewish; rather, one converts to teachings that discipline and inhibit these genetically based drives.

Nature produces matter and energy, then objective life, then subjective life, then mind and culture. The fourth movement is mostly in a minor key – and beautiful for its conflict and resolution, for the struggling through to something higher. The evolutionary epic, when it comes to the human chapter at least, is the story of good and evil.

(4) Suffering and Creation

The story is of the evolution of suffering; this too is among the emergents. In chemistry, physics, astronomy, geomorphology, meteorology, nothing suffers; in botany life is stressed, but only in zoology does pain emerge. Genes do not suffer; organisms with genes need not suffer, but those with neurons do. One is not much troubled by seeds that fail, but it is difficult to avoid pity for nestling birds fallen to the ground. In every season, most of the sentient young starve; are eaten, abused, abandoned. Life is indisputably prolific; it is just as indisputably pathetic (Greek: *pathos*), almost as if its logic were *pathos*. The fertility is close-coupled with the struggle.

There is no moral agency in nature, no immoral selfishness; that was a category mistake. There are both intrinsic and shared values. Also, without doubt, there is suffering; there is no more certain fact than this disvalue. One is not going to get religion naturalized, or socialized, until one reckons with this. *Dukkha*, that the world is suffering, is the first noble truth of Buddhism. Genesis 1-2 begins with a good world, but by Genesis 3 it has fallen, and redemptive suffering is the critical theme of both faiths.

Suffering is a troubling fact, but the first fact to notice is that suffering is the shadow side of sentience, felt experience, consciousness, pleasure, intention, all the excitement of subjectivity waking up so inexplicably from mere objectivity. Rocks do not suffer, but the stuff of rocks has organized itself into animals who experience pains and pleasures, into humans whose *Existenz* includes anxiety and affliction. We may wonder why we suffer, but it is also quite a wonder that we are able to suffer. Something stirs in the cold, mathematical beauty of physics, in the heated energies supplied by matter, and there is first an assembling of living objects, and still later of suffering subjects. Energy turns into pain. The world begins with causes, mere causes; it rises to generate concern and care. Is this now ugliness emergent for the first time? Or a valuable good, sentient life, with its inevitable dark side? Suffering too involves the historical genesis of something in kind where nothing of that kind existed before.

Pain is objectively present in nature, and what is its connection with genesis? Struggle is the dark side of creativity, logically and empirically the shadow side of pleasure. One cannot enjoy a world in which one cannot suffer, any more than one can succeed in a

world in which one cannot fail. The logic here is not so much formal or universal as it is dialectical and narrative. In natural history, the pathway to psychosomatic consciousness, the only kind of experience we know, is through flesh that can feel its way through that world. An organism can have needs, which is not possible in inert physical nature. If the environment can be a good to it, that brings also the possibility of deprivation as a harm. To be alive is to have problems. Things can go wrong just because they can also go right.

Sentience brings the capacity to move about deliberately in the world, and also to get hurt by it. There might have evolved sense organs without any capacity to be pained by them. But sentience is not invented to permit mere observation of the world, rather to awaken some concern for protection of the kinesthetic core of an experiential life that can suffer. A neural animal can love something in its world and is free to seek this, a capacity greatly advanced over anything known in immobile, insentient plants. The appearance of sentience is the appearance of caring, when the organism is united with or torn from its loves. The story is not merely of goings on, but of going concerns, that is, of values that matter.

Pain is eminently useful in survival, and it will be naturally selected, on average, as functional pain. Natural selection requires pain as much as pleasure in its construction of concern and caring; pain is an alarm system in a world where there are helps and hurts through which a sentient organism must move. On the other hand, any population whose members are constantly in counterproductive pain will be selected against and go extinct or develop some capacities to minimize it. In this sense, natural selection, so far from needlessly increasing pain, rather trims it back in the system, so far as the system can remain vital, conservationist, and developmental. Pain is self-eliminating except insofar as it is instrumental of a subsequent, functional good. Intrinsic pain has no logical or empirical place in the system; neither does maladaptive pain.

The capacity to suffer is generally accompanied by possibilities of avoiding suffering, some freedom and self-assertion. The capacity to suffer, for instance, drives the capacity for learned behavior; it brings animal life to a central focus in sentient consciousness, as cannot happen in plants. Thought appears in order to prevent pain and to affirm well-being, but the thinker that cannot feel pain cannot figure out how to escape it. In humans, this evolution of thought seeking comfort drives the transition from nature to culture.

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We cannot show this in the detail of every case; perhaps we need not expect it to be true in every case, and there are troublesome anomalies. Nevertheless, the system statistically must select for beneficial pain. The system historically uses pain for creative advance. Such is the biology of life. Theologically speaking, this position is not inconsistent with a theistic belief about God's providence; rather, it is in many respects remarkably like it. There is grace sufficient to cope with thorns in the flesh (2 Corinthians 12.7-9). Life is a table prepared in the midst of enemies, green pastures in the valley of deep darkness (Psalm 23).

The vast number of creatures sprouted, hatched, or born are, of necessity, more or less well-endowed genetically and emplaced in a more or less congenial environment, despite or including the fact that in their environment they are spurred to earn their way. Even though most will not live to maturity, they are competently programmed for their tasks. Organisms survive in about that proportion in which they are viable, so that life is sustained in any individual in relative proportion to its fitness for it. The community of life is continually regenerated, as well as creatively advanced, and this requires value capture as nutrients, energy, and skills are shuttled round the trophic pyramids. From a systemic point of view, this is the conversion of a resource from one life stream to another – the anastomosing of life threads that characterizes an ecosystem. The "waste" (as it first appears) is really the systematic interconversion of life materials; nature recycles. Death *in vivo* is death ultimately; death *in communitatis* is death penultimately but life regenerated over the millennia of species lines and dynamic biotic communities, millennia continuing almost forever.

Individual organisms must die. Species do not have to die; most, of course, do die. Ninety-eight percent of all species that have ever existed did go extinct, so there are high probabilities, but there is no law of nature or inevitability about species extinction. But here a puzzling aspect of the matter strikes us. By virtue of the smart genes, the death of the organism feeds into the nondeath of the species. Only by replacements can the species track the changing environment; only by replacements can they evolve into something else. Genera and species sometimes do die, that is, go extinct without issue, but they are often transformed into something else, new genera and species, and, on average, there have been more arrivals than extinctions – the increase of both diversity and complexity over evo-

lutionary history. The loss of species in natural systems has meant more birth than death; perhaps there too it is tragic, but it is not unredeemed tragedy. The "birthing" metaphor is at the root of the concept of "nature"; here creativity comes only with "labor" and "travail."

Genes do not suffer but they do code this story of coping with suffering. They make the story possible, necessary for it, but they are not sufficient to interpret it. The world is not a paradise of hedonistic ease, but a theater where life is learned and earned by labor; in this struggle there is something demanding appropriate respect, something inviting reverence, something divine about the power to suffer through. The cruciform creation is, in the end, deiform, godly, just because of this element of struggle, not in spite of it. Among available theories, there is no coherent alternative model by which, in a painless world, there might have come to pass anything like these dramas of nature and history that have happened, events that in their central thrusts we greatly value.

Environmental necessity is the mother of cultural invention. An environment that was entirely hostile would slay us; neither life nor culture could ever appear there. A nature that was entirely irenic would stagnate us; human life could never have appeared there either. All human culture, in which our classical humanity consists, originated in the face of oppositional nature. Nature insists that humans work, and this laboring and even suffering is its fundamental power for genesis. Creativity is through conflict and resolution. We suffer, and lest we suffer more, we organize ourselves creatively. In that sense, humans owe all culture to the hostility of nature, provided we can keep in tension with this the support of nature that is truer still, the one the warp, the other the woof, in the weaving of what we have become.

Early and provident fear moves half the world. Suffering, far more than theory, principle, or faith, moves us to action. One should not posit the half-truth for the whole; we are drawn by affections quite as much as pushed by fears. These work in tandem reinforcement; one passes over into the other and is often its obverse. In this sense, pain is a prolife force. In the evolution of caring, the organism is quickened to its needs.

Nor in humans is there only physical pain. Spirits know affliction. In humans the relationship between bodily wounding or deprivation and pain is quite complex, involving cognitive factors such as cul-

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tural conditioning and psychological evaluation of the situation. Sin appears, as do guilt, insult, humiliation, reproach, grief, angst, alienation, remorse. This is why such things as rape and slavery have meanings in culture that simply do not transfer to bluebirds or ants. One becomes reflectively self-conscious about the values of which one is deprived, sometimes by nature but now even more by the exploitations of culture. One knows one's social status, not just one's physical or biological state, and the former may determine behavior more than the latter. The concept one has of oneself, the gap between one's perceived real and ideal, and the placing of responsibility for closing of that gap, become critical.

All this drives the religious life. In human spirits, the distinctive characteristics of spirit make tragedy and redemption possible. Birth is superseded by rebirth; the question of generation by the question of regeneration. Any adequate interpretation of this story of spirits fallen into tragedy and redeemed from this fall is going to be irreducibly religious. That is the essential theme of Christianity and Judaism, for example, that suffering love is divine – and we doubt whether there is any competence in biology to evaluate whether this is true or false, although biology has competence enough to document the struggle for survival, the sequence of life, death, and life renewed. Zoology, perhaps joined with psychology, can raise the problem of suffering, but its redemption is a religious issue.

The way of history too, like that of nature, only more so, is a *via dolorosa*. Since the beginning, the myriad creatures have been giving up their lives as a ransom for many. In that sense, Jesus is not the exception to the natural order, but a chief exemplification of it. The secret of life is seen now to lie not so much in the heredity molecules, not so much in natural selection and the survival of the fittest, not so much in life's informational, cybernetic learning. The secret of life is that it is a passion play. This is the labor of divinity, misperceived if only seen as selfish genes.

In this evaluation, we have not painted the world as better than it is in the interests of a philosophical metaphysics, nor worse either; rather we have tried to see into the depths of what is taking place in natural history. The view here is not panglossian; it is a tragic view of life, but one in which tragedy is the shadow of prolific creativity. That is the case, and the biological sciences with their evolutionary history can be brought to support this view, although neither tragedy nor creativity is part of their ordinary vocabulary.

2. RELIGION AND FERTILITY

Religion, we have been claiming, is a response to the prolific Earth. There is an alternate account of the connection between religion and fertility. There is no religious behavior in nature, just as there is no moral behavior among the animals and plants. But humans behave religiously in culture, almost invariably so in classical cultures, and extensively still in modern cultures. Why so? For those wishing to explain, within the framework of biology, the genesis of religion in its connections with the genes, the evident way is to apply natural selection. Persons who are religious leave more offspring than those who are not. Persons who practice religion x leave more offspring than those who practice religion y . Religion a produced better adaptive fit in hunter-gatherer cultures; religion b produces better adaptive fit in agricultural cultures; religion c , in technological cultures. These begin to sound like claims that could be formulated in a statistical, mathematical model. Birth rates are measurable, though if one is to correlate them with religions one will need also to put numbers on the degrees and kinds of religious belief.

Such a religion-producing-offspring model might have been the way in which religion originated, or classically functioned, but no longer the way religions operate. In either case, the past numbers will now be hard to obtain. But this might also be elemental in all religion, and therefore the way religions operate today, in which case the theory might be more testable. Religious behavior in culture in any specific form is acquired, not innate, but there seems some genetic tendency to acquire some religion or other. The novelty is religious behavior, previously absent from all other fauna and flora, but, when religion emerges in humans, the fundamental biological rules still apply. The fittest – in this case, the religious – survive.

Wilson recognizes that religion is a critical test case:

Religion constitutes the greatest challenge to human sociobiology and its most exciting opportunity to progress as a truly original theoretical discipline. . . . Religion is one of the major categories of behavior undeniably unique to the human species. The principles of behavioral evolution drawn from existing population biology and experimental studies on lower animals are unlikely to apply in any direct fashion to religion. (1978, p. 175)

There are reasons to believe that the deeper operations of religion will be concealed from its practitioners. Nevertheless:

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When the gods are served, the Darwinian fitness of the tribe is the ultimate if unrecognized beneficiary. . . . The highest forms of religious practice, when examined more closely, can be seen to confer biological advantage. Above all they congeal identity. In the midst of the chaotic and potentially disorienting experiences each person undergoes daily, religion classifies him, provides him with unquestioned membership in a group claiming great powers, and by this means gives him a driving purpose in life compatible with his self-interest. (1978, pp. 184 and 188)

It is certainly true that fertility is a fundamental theme in primitive religions. Practitioners seek the fertility of fields and flocks. They worship the sun and its warmth, they pray for rain in drought, they dance to help the maize grow. They seek fertility in childbirth. They seek cures from diseases for themselves and their children. The etymological root of "salvation" (Latin: *solus*) is "health." "Elementary religions seek the supernatural for the purely mundane rewards of long life, abundant land and food, the avoidance of physical catastrophes, and defeat of enemies" (Wilson 1975a, p. 561).

Religious rituals and ethics get people to cooperate for their mutual good. Since people have to eat daily, reproduce each generation, and care for children throughout much of their adult lives, it is unsurprising that fertility – success in staying alive from one generation to the next – is pervasive in religions that have succeeded. Any religion persisting over the centuries will, necessarily, result in reproductive success. We know that before we look.

Such elemental fertility is there right at the origin of Hebrew monotheism. Yahweh's divine promise to Abraham, frustrated because he was childless, was "I will make of you a great nation" (Genesis 12.2). Abraham did not even have one child yet, and God promised to make of him a nation; that's real reproductive success! The Abrahamic covenant is sealed by circumcision, a genital sacrament if ever there was one! Moses at Sinai renewed this covenant and God commanded children, "Honor your father and your mother, that your days may be long in the land which the Lord your God gives you" (Exodus 20.12). God gave the Israelites a promised land, flowing with milk and honey.

Boldly stated, all religions are fertility religions. "The biology of religion," according to Vernon Reynolds and Ralph Tanner, "looks at religions in terms of their contributions to individual (and, though to a lesser extent, group) survival and reproductive fitness" (1983,

p. 267; 1995, pp. 38-40; Reynolds 1991). This is the analogue of the previous claims that science and ethics are to be understood, at deepest level, in terms of the fertility they produce. The general theory of religion and its practices is that "these rules and the actions resulting from them are adaptive in the sense that they are found in countries where the results they produce will tend to enhance the reproductive success of individuals following them. Religions thus act as culturally phrased biological messages" (1983, p. 294; 1995, p. 40).

This faith-fertility correlation can be cast into testable form and verified, so Reynolds and Tanner claim. They grade religions comparatively according to the impetus they give to reproductive activity. The result is a spectrum (Fig. 6.1) on which the maximally "pro-natalist" religion is Islam and the least reproductive is Protestant Christianity (1983, p. 289; Reynolds 1991).

Some general positive correlation between religion and fertility sounds plausible. We cannot simply consider birth rates, of course, but must see how many children survive to reproductive age, and so general health and diet are critical. We need to know how religions contribute to sanitation, to parent-offspring and family caring and sharing, to solving of conflicts, to work initiative, what attitudes they have toward material necessities, which religions best stabilize societies and families sufficiently for the decades of child rearing, and so on. Reynolds and Tanner conclude that essentially "a religion is a

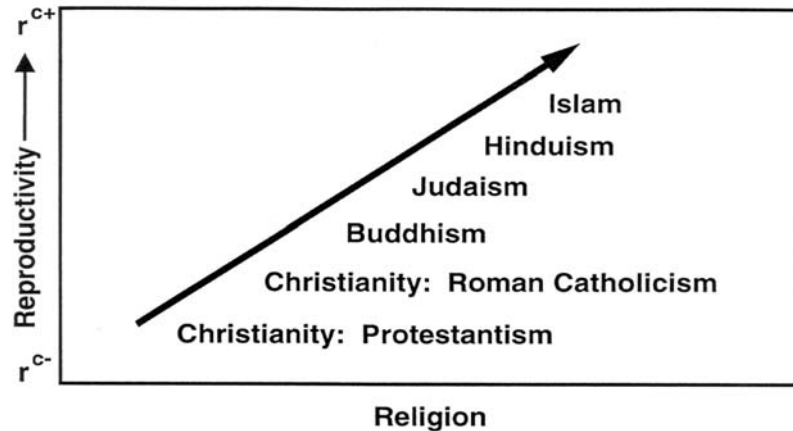


Figure 6.1. Religions and reproductivity (following Reynolds and Tanner 1995; 1983, p. 289).

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primary set of 'reproductive rules', a kind of 'parental investment handbook'" (1995, p. 40; 1983, p. 294).

Different religions produce different sorts of comprehensive fitness appropriate to local circumstances. In some environments (typically the uncertain ones, with high mortality rates), it is advantageous to have many children, though each child has reduced survival likelihood, but in others (the more stable ones) it is advantageous to have few children with high survival probability. So it turns out that the pronatalist Muslims may not have the edge over the Protestant Christians after all, if the latter have lots of Yankee ingenuity or high medical, agricultural, and industrial technology and a Puritan work ethic or a stable democratic society.

There is a well-known model in ecology that describes differing reproductive strategies. On one end of a spectrum there are species with a reproductive strategy of numerous offspring in disturbed environments (r -selected species), and on the other are species producing fewer offspring in stable climax ecosystems (k -selected). The model needs to be adapted for humans; Reynolds and Tanner propose an analogous cultural variant r^c+ (high birth rate) model versus a r^c- (low birth rate) model (1983, pp. 11-17, and 269-270; 1995, p. 39; Reynolds 1991, p. 209). Protestants do not need to breed much; they are r^c- selected, not r^c+ selected.

Since it is difficult to compute quantitative judgments on all this, Reynolds and Tanner think that they can simplify the problem and get a fair estimate by looking at per capita energy consumption and gross national products, which are indicators of how prosperous a stable society has become (1983, pp. 290-295). Here the White Anglo-Saxon Protestants (WASPs) outconsume the poor Muslims and Hindus. That high consumption and production explains how the WASPs get their fewer children more often to reproductive age. At the same time the higher birth rates in the pronatalist religions, dominant in the lesser developed countries, explain the persistence of Islam and Hinduism. So now it turns out that all the religions on the spectrum, despite differentials in birth rates, have enough overall reproductive success to remain viable in their respective niches on the world scene.

Such an investigation may seem to have proved the religion/fertility thesis, but it may just as well be that it has assumed it. The only religions calibrated on the spectrum were religions that we knew before we started had supported substantial populations over gen-

erations. All that has been asked is whether differing religions, all successful, might succeed by varying their emphasis on number of children born relative to subsequent parental investment, depending on circumstances. Put that way, however, it seems entirely possible that one or more of these religions may, in different circumstances, allow differing reactions. Protestant Christians, for instance, in earlier centuries had higher birth rates. In 1800 in New England, when the birth rate was 7, compared to 2.1 in 1990, was the environment more or less stressful or stable than it is now? It is hard to say.

Christianity, over the centuries and around the globe, has persisted in remarkably diverse circumstances, as often nondemocratic as democratic, as often nontechnological as technological, as often in unstable as in stable environments, as also has Judaism. Buddhism has persisted in quite diverse environments, from ancient India to modern Japan. Reynolds claims that Christians, who are less pronatalist, do better in Europe because this is a less stressful environment than the Middle East, where the quite pronatalist Muslims flourish (1991, pp. 210-214). But Islam, Judaism, and Christianity, religions at both ends and the middle of the spectrum, all originated in the same place, the Middle East, where their originators presumably had about the same stressful or stable environments with which to cope. And all three spread widely. By this time we are beginning to lose any meaningful correlation between religion a and its r^c+ selected strategy or religion b and its r^c- selected strategy. All we are really left with is what we knew before inquiry, that the major world religions can encourage various behaviors enabling people to survive over generations in differing kinds of environments.

Wilson seems to think it embarrassing that seeking the "supernatural" brings "mundane" rewards, but this comes as no surprise to Jews or Christians. Moses urged, "You shall walk in all the ways which the Lord your God has commanded you, that you may live, and that it may go well with you, and that you may live long in the land which you shall possess. . . . And the Lord commanded us to do all these statutes, to fear the Lord our God, for our good always, that he might preserve us alive, as at this day" (Deuteronomy 5.33; 6.24). Jesus taught his disciples to pray for their "daily bread." "Therefore do not be anxious, saying, 'What shall we eat?' or 'What shall we drink?' or 'What shall we wear?' For the Gentiles seek all these things; and your heavenly Father knows that you need them all. But

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seek first his kingdom and his righteousness, and all these things shall be yours as well" (Matthew 6.31-32).

Meanwhile, we do not yet know whether fertility is the sole or chief determinant of religious beliefs and behaviors, nor what the relation may be between persisting religions, all of which must be functional in this regard, and their truth. The true ones, if there are any, might be equally fertile with the untrue ones, if there are any; or the true ones might be more, or even less fertile, than the untrue ones. Fertility and truth might be independent variables. To this relation among fertility, functionality, and truth we will later return (Section 4).

One religion, Judaism, might seem to provide a convincing example of the connection between genetics and religion. Judaism has been especially effective at keeping racial stock and religious convictions together; most Jews religiously are Jews genetically, and this pattern has persisted for thousands of years. But we no sooner note the Jewish example, positively corroborating the theory, than we run head on into a counterexample that seems decisively to falsify it. Jesus, a Jew, launched Christianity, which spread into the uncircumcised, Gentile world; gave up most of the distinctive ritual observances of Judaism; replaced previously existing religions all over the ancient Mediterranean, spread to Europe, and thence to many parts of the world. Today approximately one third of humans on Earth, well over a billion persons, are Christian, either in conviction or by heritage. Compared with these Christians, the Jews are minuscule in number.

Few Christians have any genetic relationship with the early Semitic Christians; Jesus had no offspring at all. The genetic survival value of Christianity, if there is any, is smeared out over thousands of different racial stocks in hundreds of countries. Christianity may be a parental investment handbook, but it seems that anybody can use it, around the globe and across the centuries, regardless of genetic origin. There is no identifiable relationship between this or that set of genes and Christian belief and behavior.

The Jewish genes-belief-behavior connection, if there is one, is only a fragment of the evidence, most of which dissociates specific genes, belief, and behavior. Even the Jews have long insisted on identifying what was specifically Jewish in their religion (the Abrahamic covenant the Mosaic observances), separating this from what in Ju-

daism also applied to the Gentiles and was to be a blessing to all nations (the Noachic covenant, ethical monotheism). Meanwhile, Christianity (as do all other persisting religions) has to result in Christians' regenerating themselves biologically over the generations. After all, one has to be born before one can be born again, even if being born again of the spirit then feeds back into the birth rate and results in more births in the flesh. If there ever were a divinely revealed religion by an ethical monotheist God, one would expect it to further the welfare of those to whom it was given. In that sense both the theological and the biological theories of the origins of religion predict the same results: prosperity over generations. If we observe such prosperity in actual history, either or both theories may be true.

Where religion brings such prosperity, reached as this must be by successful surviving through difficulty, by the creativity inseparable from suffering (Section 1[4]), this invites persons to return to reflection on the prolific Earth, the larger genesis into which human generativity is now incorporated. Perhaps, to some extent, religion results from and is generated by selection for fertility, a coping "myth" maximizing offspring or at least inspiring caring for offspring. In that respect, there is nothing ungodly about a religion that brings a fruitful life, including both prosperity and children.

But that truth will have to be put in a larger picture. Religion may arise as a coping myth ("the gods are for us and our children"), but what is one to say when the truth is found: that there has been successful coping over three and a half billion years, in which the local self now takes a part and plays a role. Perhaps it was once true, in the launching of religion, that the earliest humans mythologized these powers as sacred, personified them, and that this proved adaptive in child rearing. Perhaps religion is still useful in this way. But after that, these generative powers are in fact there surrounding us, past and present, to which any worldview must be suitably adapted. To see such creative process as sacred, to detect a Creator present, is as plausible an interpretive framework as any and is an explanation adequate to the results. These prevenient vital powers, sacred powers, numinous Presence in, with, and under the emergent phenomena, are, after we learn genetics, no less still there in and with the genetics underlying the genesis.

Religion results from and is generated by reflection over, as well as participation in, a prolific Earth. Genes generate a mind, which

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generates religion, which supports genetic survival. Such a mind, formulating its religion, protects its offspring, and also encounters the surrounding genesis in natural history, recorded in the genes of others, humans and nonhumans. Such a mind encounters also the human genius generating the myriad cultures, including that of its own heritage. The local self with its family line participates in wider communities of shared values, and an account of that too is significant in the religious challenge. We are back to the question of "others" and the sharing of values, now in religious form.

3. RELIGION AND ALTRUISM

Close analysis – Wilson, Reynolds, and Tanner were claiming – will show that all successful religion is really "selfish," in the sense of serving one's genes. In view of the fact that the most successful religions routinely urge altruism and censure selfishness, sociobiologists and behavioral psychologists will have to show that this altruism is only apparent and that these religions do in fact support biological selfishness. Or one will have to find some account(s) to give of this emphasis on altruism that can reinterpret it within the general biological theory. Or perhaps the altruism will be revealing counterevidence. Religion generates a social phenomenon that biology is incompetent to handle, either to explain or to evaluate. If so, such naturalistic accounts of the genesis of religion will be partial, at best. Religious accounts of the genesis of this altruism might be complementary or corrective to the biological accounts.

As with ethics before, we need to remember that religion is more than altruism. Religions too are concerned with justice, fairness, equitable sharing of resources, prudent care of oneself, a right relationship to God or the gods; with placating the spirits; or with reaching nirvana, or union with Brahman, and so on. In the Judeo-Christian tradition, the desired goal is often said to be a state of righteousness. In the vocabulary recommended here, this optimizes values, now religious values, both in the personal lives of believers and in the lives of those they benefit.

(1) Religion Generating Altruism

Many religions urge altruism; this is as frequent a theme as is increased fertility (Hefner 1993, chapters 11-12). Judaism summarized

its ten commandments into two: love God and neighbor, which Jesus enthusiastically endorsed. New Testament writers prefer the Greek term *agape* over *eros*. *Eros* is an acquisitive love, responding to value in the other and being fulfilled by that other; *agape* is a giving love, offered regardless of value in the other and any reciprocating benefit. *Eros* may be a good thing in its place, but *agape* cares for the other more sacrificially. These writers did not think that *phileia*, brotherly love, was profound enough to embody the Christian ideal. One ought to love the other as one does oneself. Augustine summed up the Christian ethic: love and do what you will. He contrasted the self-centered love, *concupiscence*, characteristic of Babylon, with an other-(altru)-love, *caritas*, characteristic of Jerusalem.

Buddhism's first commandment is noninjury to others, *ahimsa*; the *bodhisattva* takes a vow of *karuna*, compassion on all beings:

I have made the vow to save all beings. All beings I must set free. The whole world of living beings I must rescue from the terrors of birth-and-death. . . . My endeavours do not merely aim at my own deliverance. For with the help of the boat of the thought of all-knowledge, I must rescue all these beings from the stream of Samsarsa. (*Vajradhvaja Sutra*, 280-281)

The four noble truths locate the fundamental human disorder in thirst and clinging, in a grasping that feeds and satisfies the self; the route to salvation is by an enlightenment, *nirvana*, where one sees that the self is unreal, *anatta*.

Contented, easily supported, with few duties, of simple livelihood, controlled in senses, discreet, not impudent, he [the *Bodhisattva*] should not be greedily attached to families. . . . Just as a mother would protect her only child even at the risk of her own life, even so let one cultivate a boundless heart towards all beings. Let one's thoughts of boundless love pervade the whole world – above, below and across – without any obstruction, without any hatred, without any enmity. (*Suttanipata*, I, 8)

That certainly doesn't sound like selfish genes. Neither *agape* nor *karuna* seems to be explicitly or implicitly promoting the self; this altruism runs counter to the fertility elsewhere vigorously sought in religion. What is one to make of religion exhorting altruism?

There is no problem when the altruism so promoted binds kin

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group loyalty and facilitates tribal group reciprocity. This promotes inclusive fitness. Benefits redound to self and/or kin. But is this account of only-apparent altruism always plausible? Mother Teresa was certainly behaving with biological somatic altruism, since the food she fed to Indian children she herself could not eat (Muggeridge 1973). She was also behaving with genetic altruism, since Mother Teresa had no children herself, and many of the Indian children she fed have themselves grown up and reproduced. Nor is she related to these children.

This is hardly reciprocal altruism. Although she benefited nonrelatives, there was little resulting benefit to Mother Teresa's somatic self. There is no cause to think that Mother Teresa went to India because of the likely reciprocators there, or stayed many decades for this reason, or that her efforts in India were helping her relatives back in Yugoslavia and Albania to reproduce. Mother Teresa was not backscratching with unrelated others, nor did she expect these others to backscratch her nieces and nephews. There is no particular problem if Mother Teresa received an occasional bit of help in return for her charity, if for instance some young girl reciprocated and cooked food for Mother Teresa. But the net flow of benefits cannot be to Mother Teresa; the recipients of aid are, after all, the poor of India.

There is moral altruism, if we are able to give any credence to Mother Teresa's verbal reports. Whether or not we accept her reports, just observing her behavior alone, the biological selfishness interpretation is rather implausible. What is the evidence that she was not doing what she intended, helping nonrelated others, and doing it because of her religious convictions about divine love? Religion was also operating with the Good Samaritan. This joining gives us no cause to suspect either the morality or the religion.

Mother Teresa ate daily, conserving her biological somatic value, and there is no cause to censure her for selfishness in doing so. She also cared for the intrinsic values in those she fed. There is some reciprocity as those values are shared, backscratching. No religion protests when persons help each other out. In all this there results much conservation of biological genetic value. The Indian children live to reproduce. Mother Teresa knew, of course, that not everyone can or should be religiously celibate. There would be no next generation.

(2) Religion Generating Pseudoaltruism?

But, comes the protest, most persons are not like Mother Teresa; most look out for their own interests, and those of their next of kin. Most are sinners, few are saints, and, even among the saints, seldom do we find those as charitable and self-denying as Mother Teresa. What is protested is, one should notice, also what Mother Teresa herself, in her religion, taught: that by their first nature humans are selfish, and that such nature needs redeeming before humans can operate with this regenerated nature. That real sinners outnumber ideal saints has never been taken to discredit religion, although religion might be discredited if it could produce no working examples at all of the sorts of persons it recommends. Religion does in fact produce numerous such models. They are the myriad exemplars of the religious heritage, and the devout follow them with some measure of ideal mixed with real.

Alexander, Ruse, and Wilson claimed earlier, dealing with the Good Samaritan (Chapter 5, Section 3[1]), that the whole process works better if people are deceived about their deepest motives. We call this pseudo-pseudoaltruism, because not only is the *behavior* only apparently altruistic, really self-interest, but the *intention* too is apparently altruistic, as the selfish intent is screened off from the moral agent. Religion has a particular genius for inculcating this deception. The gods command this altruistic behavior. Loving God urges loving one's neighbor. If one can come to believe that, then there will be zeal indeed; one's real motives will be rationalized as obeying God. Religion is an especially powerful incentive reinforcing this (apparent) altruism. Perhaps altruism even originated in religion. Until modern times, most ethical behavior was entwined with religious behavior. The discussion in the previous chapter left something important out, assuming that ethics arose from mutual cooperative advantage, a social contract, without any serious look into its historical integration into religions. Ethics needs the sanction of religion to get established.

On this account, from here onward, one will not be able to ask religious people what they think. Humans are doubly mistaken, both about the altruism and about god(s). But one can watch what they do. These doubly mistaken humans are nevertheless productive; their mistake recouples religion and fertility in a surprising way. If the theory is true at a first level, one would expect ethics and religion

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to remain tribal, favoring kin selection, where the nearby genes are. The religions preach that "charity begins at home." Such charity, a misnomer, is actually genetic selfishness. Be that as it may, no classical religion teaches that charity stops at home, and yet this is the teaching one should expect, if religion were selected to promote a familial genome. Over recorded history, this has not been the trend at all. Religion and ethics are tribal at the start, but both together go universal, replacing tribal religions. Seemingly, that trend should have been selected against.

Charity in religion expands beyond the family, as was evident in Mother Teresa's actions, and now the genetic theory has to accommodate this by supposing that the charity is really reciprocal bargaining for benefits, gained by group association. The beyond-home charity ends up producing likely reciprocators. Recalling indirect, social altruism (Chapter 5, Section 2[4]), reciprocation does not have to be one on one; the religious operator is setting up a general cultural climate in which there is reciprocity. The individual does well in a Christian society, no matter whether the other Christians are genetically related, no matter whether the help received and given is in direct exchange, or statistically averaged out in a Christian community.

Religion is not adverse to one's being a good neighbor, or having good neighbors either. The organic model, one body with many members mutually supporting each other, is a favorite model of the church (1 Corinthians 12). But, in the end, when the question, Who is my neighbor?, is asked, the answer comes in terms of who is in need that I can help meet, not who is likely to reciprocate with net gain to myself. Universal morality has regularly been religiously based in the classical world religions – those religions that moved from tribal and national levels to become international and intergenerational faiths.

The pseudoaltruist will have to say that such moral persons were just setting up a world moral climate in which they themselves were most likely to prosper genetically. Charity is always a misnomer. Mother Teresa did not gain any personal benefit, but she did get the spread of the benefits of religion from India back to Yugoslavia, benefits that in her case started in Yugoslavia, her childhood home where she was reared religiously and later moved to India – benefits that started centuries before in Palestine and once moved to Yugoslavia, being shared by all who transmitted this religious altruism en

route. That kind of religion is rather curiously selfish, setting up this pervasive cultural climate; indeed it has become almost indistinguishable from what the ethical monotheisms have taught. Nevertheless, Wilson is sure that, one way or another, Mother Teresa, even in her sainthood, remained "cheerfully subordinate" to her "biological imperatives" (1978, p. 166).

Mutatis mutandis, one can give the same account of the spread of Islam, with its ideas of universal brotherhood, and even of the spread of nonmonotheistic Buddhism from India to China and Japan, motivated by the *bodhisattva's* ideal of universal love.

One can adamantly hang on to the selfishness paradigm, but this is a topsy-turvy kind of selfishness that has to act on universal altruism, and evangelize this faith to the world, that is, to share it with everybody else, before it works most efficiently to one's own benefit. It is odd that to serve their genetic interests people have to go to elaborate efforts to do just the opposite, to believe universal creeds, share them with others, act on universal altruism, build characters that are caring, fair, sympathetic, forgiving, magnanimous. One can say, if one insists, that all this is just reputation building, pretense that creates a climate in which the pretender and his kin prosper as a result of the reciprocity generated. But it is difficult to see how they prosper to the detriment of the others who are the beneficiaries of this allegedly pretended altruism. None of this is really very plausible anymore. Perhaps the charity isn't just apparent after all. Maybe it is time for a paradigm switch.

(3) Religion Generating Unsuccessful Altruism?

But first, perhaps one can save the general theory that religion is fertility-maximizing another way. There is also a negative, unsuccessful version of the theory: religion does indeed produce real altruism and this results in the genetic failure of such persons – contrary to all claimed in the previous section. Religious persons benefit the genes of others, who outreproduce them, and they themselves go extinct. This is a rather surprising conclusion, and one will have to find a convincing account of the anomalous persistence of religion although its practitioners are constantly failing genetically.

Struck by the degree and intensity of altruism exemplified in Mother Teresa, sociobiologists and behavioral psychologists may try a revised account. In addition to pseudoaltruism, there can be in-

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duced altruism (*Chapter 5, Section 3[2]*). This does indeed serve the interests of the helped at both somatic and genetic cost to the helper, but it is "an evolutionary mistake" (Alexander 1987, p. 191). This switches things around. Now believers are tricked into losing. Devoutly religious persons are conned into benefiting others and will have fewer offspring themselves. Priests and nuns fail to benefit either themselves or their blood lines genetically. They are dupes, but they do help others to succeed. They help some people directly, who have more offspring in result, and their ideal, though disastrous were everyone to practice it, produces enough spillover morality to help the lay reproducer. The Indian girls have children, Mother Teresa died childless, and her relatives in Yugoslavia and Albania do not have many children either.

If this is true, however, we will expect that the genes for becoming a priest or nun will disappear from the population, and society will be in worse shape, not having these clerical benefits spilling over to the lay reproducers – and similarly and proportionately for any lay believers duped into such assistance given to their fellow lay Christians. The masses of selfish people will exploit any altruism; everybody will cheat on altruists, and they are always losing. In just that proportion by which religious persons overdo their altruism, erring into induced rather than merely apparent altruism, their genes will be selected against. "In a world of egoists, the only one who suffers from exhortations that 'Everyone should try to be like Jesus,' is the one who succeeds" (Alexander 1987, p. 127): succeeds in being like Jesus, that is, but fails reproductively, as did Jesus, and so succeeds in becoming extinct.

Mother Teresas are one in a million, priests and nuns are one in ten thousand, but lay believers have children routinely and care for them with religious zeal. They may praise their saints, preachers, prophets, missionaries, but what they are really doing is exploiting them. Parishioners get direct help from them and such figures symbolize by exaggeration what everybody needs a little of for his or her own good. One will expect these genes for an overdose of altruism to be rare. But why should they be there at all? There is a ready explanation why most persons should be easily educable into a limited altruism; this in fact serves their genetic self-interests. But we have no explanation yet why these evolutionary mistakes should persist, rare though they are.

Perhaps they are just a repeated error, like Down's syndrome or

(some say) homosexuality, neither of which facilitates reproduction. Such a tendency to repeated error might not be surprising, since there is a beneficial altruism (backscratching and winning) that is behaviorally almost indiscernible from a loser's overaltruism, distinguishable mostly by excess in degree, and everybody's intentions are screened off both from themselves and from others. The right kind of altruism, a fertility-maximizing pseudoaltruism, and a religion to exhort it, are good things genetically, though too much of them, universal morality and real altruism, is a mistake. Some unlucky mutants in every generation will edge over too far. Religion is like fertilizer; indeed religion is a kind of fertilizer. More is better up to a point, and more after that produces opposite results. A few people will regularly and counterproductively overfertilize.

Is this account plausible? Here one must remember that just this universal morality (an alleged overdose), religiously based, has been classically successful as a cognitive idea. Perhaps the one-in-a-million or one-in-ten-thousand mutant superbly exemplifies the idea, but leading intellectual traditions (Christianity and Judaism in the West; Buddhism in the East) have been conned into this idea, as an ideal though not as often real as it should be. The symbol catches on and convinces many. It is a quite a fertile idea, spreading globally, even if there is an overdose problem. The altruistic impulse does not just travel genetically from one generation to the next, passed down in modest amounts because of its reproductive success or in harmful amounts as a recurrent genetic error. The altruistic impulse is spread by conversion, by evangelism, by proselytizing; billions of persons come to hold it creedally if not behaviorally.

That is a strange mutant indeed, fertile though erroneous, one that arises rarely and harmfully, but that convinces intellectually though not behaviorally the many who become converts to the most successful religions globally. We need to explain why people around the world and across the centuries have been intellectually persuaded to accept a belief that they are not genetically disposed to adopt. Nor is this just a genetic problem of a few screwy mutants convincing millions of persons to believe what they are not disposed to believe; it is an intellectual one as well. Everybody has to have the wrong theory (universal, divinely willed altruism) to get the right result (fertility).

Holding onto the self-interest paradigm tenaciously, its defenders

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can reply that people everywhere need the overbelief (belief in too much altruism, commanded by God) in order behaviorally to act with a functionally minimum altruism (enough to produce reciprocation). The evolutionary mistake, manifested recurrently in these symbolic saints, provides the essential belief without which the masses cannot function well in their cultures. Maybe that is convincing. Maybe it is holding onto a theory when the evidence is beginning to mount against it. We are starting to wonder whether this altruism-really-selfishness thesis, modified into an altruism-really-mistake thesis, modified into an altruism-really-functionally-important-mistake thesis, modified into a wrong-theory-necessary-to-produce-right-results thesis is a paradigm proved true or a paradigm absorbing and eating up all the evidence. Perhaps it isn't a mistake at all; maybe culture needs different rules than genetic nature needs.

Perhaps we have been too generous to the saints. Already we have noticed subtle exploitation in religion, and this may be more widespread. Consider another kind of induced altruism, this time one by which the leaders gain and the multitudes lose. Religious leaders too can be self-aggrandizing; lay believers too can be the duped. The masses are conned into believing that God wills that they should faithfully obey the commandments, not to steal, or lie, or covet; to be honest, hardworking; to keep promises; to contribute sacrificially to the church. Such sanctified morality is really serving the interests of those in power ecclesiastically. Where the church supports the nation, as with an established religion, this can be also political exploitation.

"Religion is above all the process by which individuals are persuaded to subordinate their immediate self-interest to the interests of the group. Votaries are expected to make short-term physiological sacrifices for their own long-term genetic gains" (Wilson 1978, p. 176). Usually this does work to the longer-range benefit of the persons so subordinated. But it also means that such a subordinating tendency can easily be exploited by political and ecclesiastical leaders, who gather benefits from the subordinated. Now the morally faithful plebeian Christian citizens lose and have fewer children in result, while the leaders win. With the commoners kept in place contributing their support, the leaders outreproduce them. This deception too will work better if even the leaders are explicitly unaware of what is really going on. "Self-deception by shamans and priests perfects their own performance and enhances the deception practiced

on their constituents" (Wilson 1978, p. 176). Both the exploiters and the exploited think that the divine command theory is true. Wilson says:

Religions, like other human institutions, evolve so as to further the welfare of their practitioners. Because this demographic benefit applies to the group as a whole, it can be gained in part by altruism and exploitation, with certain segments profiting at the expense of others. Alternatively, it can arise as the sum of generally increased individual fitnesses. The resulting distinction in social terms is between the more oppressive and the more beneficent religions. All religions are probably oppressive to some degree, especially when they are promoted by chiefdoms and states. The tendency is intensified when societies compete, since religion can be effectively harnessed to the purposes of warfare and economic exploitation. (1975a, p. 561)

No one would claim that religion has never been used for exploitation, least of all the seminal religious reformers, who are often intensely critical of ecclesiastical and political powers.

But this error of too much citizen-practitioner morality that lets commoners get suckered into serving bishop or king is exactly what should be selected against. The bishops were celibate and didn't have any children at all; kings, nobles, and chiefs were a minority, one in a hundred or one in a thousand. There is no evidence that the rulers outbred those they subjugated. It would be surprising if the machinations of small groups of elitist rulers could exploit whole populations into behavior that was to the commoners' breeding disadvantage and do this continually over the long millennia of human history. If so, the wrong genes (out there in the subjugated masses) have to be the most common ones. The theory doesn't predict that at all.

There is one thing the theory does predict, but one has to turn to the present and future to test this. If the theory is true, when believers find out about it, they will cease their religious behavior. They will start doing whatever it is that does increase their fertility or promote their own self-interest. A "rational" person will not want to be conned into producing benefits to others at cost to himself. Religion does not work unless it is well-disguised, and to find out the truth of the matter is to cease to be religious.

(4) Religion Generating Complementary Altruism

There is another possibility, developed by Donald T. Campbell (1991, 1975). Religion produces successful altruism, humanizing persons for the passage from nature to culture. Humans evolved with animal genes, selected to conserve values under the regimes of nature, where genetic transmission is virtually the sole process for the transmission of information. But humans form transmissible cultures, and the requirements of culture differ. Natural selection is relaxed, cooperation is intensified, educability is vital, acquired learning is essential. To elevate prehumans into humans, morality arises, almost always religion-based. Morality moves humans away from their merely genetic instincts toward more appropriate behavior in culture. "Social evolution has had to counter individual selfish tendencies which biological evolution has continued to select as a result of the genetic competition among the cooperators" (1975, p. 1115; 1991).

Genes are selected that are educable for culture, but the content of such education includes the moral heritage, supplied by cultural, not genetic transmission. This content urges altruism, and the urging has to overshoot to succeed. Those religions best succeed that most help humans to pull away from their genetic instincts toward the cooperative needs in culture. This best works if they preach not just tribal but universal altruism. When such altruism is preached, the result is behavioral change in the direction of more altruism, less selfishness.

To illustrate, Campbell imagines a sort of selfishness-altruism meter, with complete selfishness at one end of the scale (0 altruism) and complete altruism at the other (100 percent altruism) (Fig. 6.2). Complete selfishness is not successful even in the animal world, certainly not among social primates, who cooperate extensively. Kin altruism plus the limited amounts of reciprocal altruism of which primates are capable might put the biological optimum at 30 percent on the altruism scale. (The numbers are only illustrative, not empirically obtained.) For humans in their exodus to transmissible cultures this is not enough. The religious preachings (here scaled as 100 percent altruism in ideal, but see the caution later) are required to pull human behavior over toward the biosocial optimum for culture, which might be 60 percent altruism. Even the best religions are not so successful as would be operationally ideal; humans fall short of their fullest social possibilities, as a result of now counterproductive

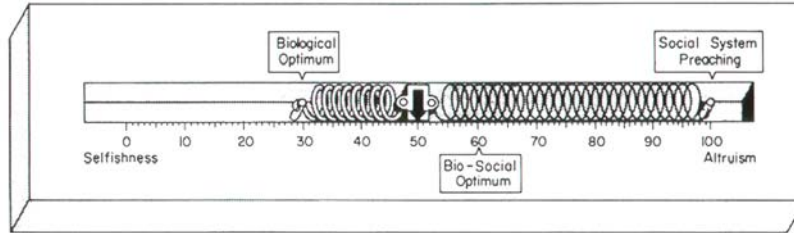


Figure 6.2. Meter illustrating tensions on a dimension of selfishness-altruism. From Donald T. Campbell, "On the Conflicts between Biological and Social Evolution and between Psychology and Moral Tradition," *American Psychologist* 30(1975): 1103-26, p. 1118. Copyright © 1975 by the American Psychological Association. Reprinted with permission.

tugging of their self-interests. The net result is that humans operate in culture with perhaps 50 percent selfishness, 50 percent altruism.

On this view, it is the religions, preaching altruism, that make culture possible; they humanize us. Without them, we are beasts. There is nothing pejorative about a beast acting like a beast, but a human ought to be something more. Beasts (primates) operate with a nonmoral, minimal (30 percent) altruism that is properly in their genetic interests, appropriate for the conservation of value at that level. Humans move toward a moral, more charitable altruism (60 percent), not only proper to but requisite for culture. At least in the behavior that religions produce, stretching humans away from our lingering, ancestral genetic dispositions, the religions are right. This is what ought to be in culture, following exodus from nature, appropriate for the conservation of emerging values at the cultural level.

The achievement of conscience, coupled with religious vision, is a surprising historical development making it possible to be human. That emergence is belied by the simplicity of the meter scale, suggesting only a quantitative where there is qualitative change. To think that the "selfishness" at the zero end is censurable is a category mistake. Altruism too changes its meaning as there is movement upscale; it enlarges its scope, universalizes, and becomes moral.

Religion now does produce a successful altruism, complementary to the biologically produced self-interest. Religions help humans to break away from what the genes, unaided, would otherwise produce. Religious ethics is superposed on the genes, facilitating the transposition to culture. Nevertheless, the religions preach a univer-

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sal altruism contrary to our best interests in culture; they overshoot their mark. If their urging is heeded too enthusiastically, the result will not be optimum for culture. Here the saints may serve as symbols in the 80 percent and above range, beneficial because they move others up to 50 percent. More saints might be more beneficial, moving us nearer the 60 percent biosocial optimum.

Also, Judaism and Christianity couple what universal altruism they urge with a respect for the self, so it is not true that the religions urge sheer altruism and nothing else. As earlier noted, Christianity, Judaism, Islam, and others commend a righteousness that combines justice and mercy, in which altruism is only one component. Religions encourage self-actualizing, though they know that this is not the whole ideal. So the meter ideal is a doubtful 100 percent, since the Golden Rule recommends loving others as oneself, not instead of oneself. This would be 50 percent – 50 percent if one insists on scaling it, though the recommendation may be about the quality of this love as much as about the quantitative amount.

Such altruism, notice, is progressively less tightly coupled to the genes. Disciples need not have the genes of the prophets, seers, and saviors who launched these teachings. In a successful world religion, they seldom do. People do better with genes plastic enough to track the best religion, whether their blood kin launched it or not. When they convert to these better religions, people are moved to act not just by their genetic programming; nor are they moved to act only in the interests of self, family, and kin. They are moved to act by what makes culture possible, including their own satisfactory life in culture. They convert to, inherit, and reinherit over generations a motivating worldview, classically oriented by religion.

This makes possible the rearing of another generation of humans, because good religion brings cultural prosperity. But just this same good religion has to be universally shared; it generates concern for other humans near and fair, relating to them with the moral values of justice, love, and respect. The commitment that one has to make transcends one's genetics, if one is to be stretched over, lifted up to sufficient altruism for high-quality social life. The fertility dimension, though it cannot and ought not to disappear, is subdued before the cultural enrichment theme. The biosocial optimum on the metered scale is not just to be measured by my progeny, not by escalating birth rates in my tribe, or population explosion in my nation, or even in the world, but by a harmonious society in which one generation

successfully transmits its valued achievements to the next, leaving them open to new achievements.

This can only be done if the best religious and moral insights are among the skills transmitted. Religions will, if you like, be tested for their capacity to do this, and the best ones will survive. The claim is not so much that the genes are the secret of religion, as that religion is the secret that makes possible the human passage from genetic nature to transmissible culture. Religion is the key to our humanity. Religion is required for the genesis of culture; cultures are required to generate religion, else they go extinct.

Such an account makes the future problematic. If religion disappears, humans will revert to being beasts – unless they can find something else to do the job of religion. Perhaps a rational morality, autonomous from religion, can command such obedience. But there will not be much hope in looking to genetics to supply such ethics. What is needed is a culturally acquired motivational power that pulls away from genetics, that genetics itself cannot supply.

(5) Religion Converting Others

There can be too much focus on biological fertility. Religion has to be understood as reproduction cognitively, believers making more converts, as well as biologically, believers having babies. In analogy to science, a scientific idea outcompetes its competitors, and wins adherents, and they fare well in their world. Religions have fertile ideas, and people adopt them the better to cope. But the transmission process is neural, not genetic. One has to be indoctrinated into a religion.

"A form of group selection operates in the competition between sects. Those that can gain adherents survive, those that cannot fail" (Wilson 1975a, p. 561). We know before we ask that surviving religions must recruit adherents from one generation to the next. Those that can proselytize increase. That is tautological. If the claim is that those religions succeed that make the most converts (where success means making the most converts), who will doubt it? We do not need biology to be convinced of that.

Biologically speaking, the problem now is that, if this is effective proselytizing, the new adherents soon cease to have any genetic relationship to the proselytizer. Only a minuscule fraction of the billion or so persons who are Christians have the Jewish genes of Christi-

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anity's founders. Most do not have the Greek or Roman genes of the first generations of Christians either. What good are all these Christians around the world to the Semitic, Greek, or Roman launchers of Christianity, or their present-day descendants?

Wilson claims that the function of religion is to produce group loyalty for the local or tribal survival unit. Those who were indoctrinated with primitive myths and rituals had intense and unquestioning loyalty to their society, and they obeyed their leaders' decisions in situations in which it was more important to act in concert than to think critically and independently. Such concerted group action conveyed survival value on all, on average, so that it was to any individual's probable advantage to cooperate, even though he had some risk of losing (being killed in battle, for instance). Under the influence of such religions, persons acted altruistically, but this was really pseudoaltruism, because it was in their genetic self-interest to bond to others in this way.

Such an explanation has a certain plausibility dealing with tribal religions. Perhaps it explains certain contemporary phenomena, such as the kamikaze pilots of World War II, dying for the emperor. But it is powerless to explain the universalism in the major world faiths. The most successful world religions have spread widely, typically as a result of the missionary activity of their adherents. Christianity has spread from its origins in the Semitic Middle East throughout the Greek and Roman worlds, throughout Europe, North America, and even the world. Buddhism spread from India to China and Japan, to California.

The Muslim armies advanced outside the Semitic world, across North Africa, into Spain, into India. That makes sense if one is gaining plunder in one's group self-interest or inducing others to serve one, but it makes no sense if one is spreading a religion that benefits nonrelatives. Even this "religion of the sword" was as much spread, southward in Africa, by the Sufis with their mystical visions. It was entirely so spread in India, Indonesia, and the Philippines, going where Muslim armies never went. *Dar-al-Islam*, the household of Islam, joins in daily prayer millions facing Mecca in solidarity and equality under God. Every one of the five principal pillars – conversion by profession of faith, daily prayer, fasting, almsgiving, and the pilgrimage to Mecca, joining other Muslims from around the earth in common submission to God – violates genetics in the name of universal fraternity.

If the function of a religion is to provide fervent loyalty for a tribal group, urging one's religion on aliens is exactly the wrong behavior. Missionary activity is helping to ensure the replication of genes unlike one's own. If one has a religion that serves his genes, holds his society together well, and produces numerous offspring, then the last thing he wants to do is share this religion with others. He would be giving the secret away. That would be altruism of the most self-defeating kind! Proselytizing those with foreign genes is the worst religious mistake you can make from a genetic viewpoint, and yet it has been the secret of success of all the world's great religions: evangelism in Christianity, or the *bodhisattva's* vow in Buddhism.

Even Judaism, the one classical faith that might first seem best to fit the religion-genes theory, belies it. "I will make of you a great nation and ... by you all the families of the earth shall bless themselves" (Genesis 12.1-3). On the genetic explanation, the second half of the promise undoes the first half. To be a people chosen by Yahweh to prosper in a promised land and to have descendants as numerous as the stars – that is to have a religion that leaves one with many offspring. But to be chosen by God to launch a religion in which everybody else also gets blessed? That is no genetic gain at all. That is a self-defeating religion, foolishly altruistic, and it will be selected against. On the genetic view, the first half of the promise has caused Judaism to survive for three thousand years; the second half of the promise is paradoxically antithetical to the first half. But surely, outside the genetic view, it is quite plausible to argue that ethical monotheism has had benefits that many others could share, and that this happened when (via Christianity), the Romans, the Germans, the British, the Americans adopted it, 99 44/100 percent of them without any Jewish genes at all.

The tribal group does need to reach a functionally efficient size, and one might want to indoctrinate enough others, preferably kindred or at least those of the same race, to reach this critical size. Beyond that, why should one send missionaries abroad to convert the Gentiles? They live in other nations and are not part of one's own political or economic survival unit. This preaching to the unconverted is not predicted by the theory, nor explained retrodictively. The Great Commission is, "Go therefore and make disciples of all nations" (Matthew 28.19). But the "Catholicism" is counterproductive to any leaving of more Semitic genes in the next generation.

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These outsiders from afar coming into the faith will convey incoming benefits only if they are needed reciprocators or can be exploited. They have to be made allies or colonies politically or economically. But evangelism is not always covert politics or economics. In the classical religions, the question ceases to be what tribe or clan a person is from, whether he or she is ally or enemy. The question is, Can he or she be saved? The secret of success is preaching a universal concern. Should we then argue that a group, covertly or tacitly to defend itself, discovers a faith that it shares with as many others as it can persuade around the world? That seems odd, that group self-defense requires proselytizing the world. A world mission is not covert intergroup altruism. If intergroup altruism must become intragroup altruism in order to retain its intergroup altruism, we can begin to doubt whether all these other groups evangelized are really nothing but needed reciprocators or subtly exploited aliens. No doubt one nation benefits when another is converted to a just and charitable form of life. Every nation benefits from harmonious international relations, to which religiously based ethical convictions about "the brotherhood of man" or "universal human rights" or "loving your neighbor as yourself" may contribute. But there is no reason to think that this expanding of altruism to the ecumenical limit is maximizing the group interest of those who launched Christianity.

Behavioral psychologists generally hold that humans are genetically inclined to xenophobia. The gene-fertility theory easily predicts this inclination in animals and has found it confirmed. "This xenophobic principle has been documented in virtually every group of animals displaying higher forms of social organization" (Wilson 1975a, p. 249, cf. pp. 286-287). This may have carried over to our early human ancestors. Possibly for millions of years natural selection favored those genes that caused the protohumans to be altruistic toward members of their own group but intolerant of outsiders. Possibly, humans today still have that innate tendency. Possibly, primitive religions are of this xenophobic kind; some sectarian religions today remain partisan. Possibly the principle works in politics. "Xenophobia becomes a political virtue" (Wilson, 1975a, p. 565). Love your neighbors and hate your enemies.

The one thing impossible is a xenophobic universal altruism. "The essential characteristic of a tribe is that it should follow a double

standard of morality – one kind of behavior for in-group relations, another for out-group" (Wilson 19753, p. 565).¹ But the major world faiths have escaped this, not only in ideal but also in the real proportionately to their success. And it seems impossible to explain this "xenophilia" on the basis of genetics. Somehow, somewhere, they reached insight into a better standard of what is right.

"You have heard that it was said, 'You shall love your neighbor and hate your enemy. But I say to you, Love your enemies'" (Matthew 5.43). Putting it another way, we even have to "hate" our families to be disciples of this universal love. "If anyone comes to me and does not hate his own father and mother and wife and children and brothers and sisters, yes, and even his own life, he cannot be my disciple" (Luke 14.26). That certainly doesn't sound like promoting one's genetic interests. "Whatever living beings there may be – feeble or strong, long or tall, stout, medium, short, small, or large, seen or unseen, those dwelling near or far, those who are born and those who are yet to be born – may all beings, without exception, be happy-minded" (*Suttanipata*, I, 8). If Christian and Buddhist say this universalism came by divine insight, prophecy, revelation, or mystic vision, there is nothing in genetic theory to gainsay such claims.

One converts to a religion culturally. "The idea of God" has "high survival value" in the pool of memes, as Dawkins puts it. "The idea of God is copied ... readily by successive generations of individual brains. God exists, if only in the form of a meme with high survival value, or infective power, in the environment provided by human culture" (1989, p. 193). Large numbers of peoples have adopted religions that did not come with their ancestral genetic sets. One does not need Semitic genes to be a Christian, any more than Plato's genes to be a Platonist, nor Einstein's genes to adopt the theory of relativity. Religious beliefs overleap genes. But that does not confirm the religion/fertility hypothesis; it falsifies it.

Perhaps there is a competition between religions – some win, some lose – and in result people often convert to a faith originated by somebody other than their progenitors. Nevertheless people settle in on some religious belief that promotes their fertility. But this faith reached by conversion in the parents has to be transmitted to the children, who will be, as were their parents before, subject to proselytizing. A religion, to stay around, has to have a reproductive capac-

¹ Quoting Garrett Hardin.

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ity cognitively. These beliefs must be transmitted nongenetically, though, when adopted, they promote fertility. But here the cognitive content of the successful religions is universalistic, and if so, the children will soon be spreading this fertility-producing faith to nonfamily and nongroup aliens. Perhaps they will be going off on missionary journeys again or contributing money to support such missions. Once we allow that a faith spreads by its persuasive powers, and that a vital element is universal altruism, it becomes impossible to keep the benefits local and in-group.

The function of religion is not simply to produce unthinking group loyalty, but to deal with many aspects of human nature that need to be curbed if optimal social cooperation is to be achieved, for example, selfishness, pride, greed, dishonesty, covetousness, anger, jealousy, sloth – aspects of human nature that are not genetically specific but are ubiquitous problems of *Homo sapiens*. These problems indisputably have some roots in our genetic past, but these shortcomings are common to all flesh. The religions that have stood the test of time have unanimously taught that humans must discipline and inhibit many tendencies in human nature. Here biology "frames" religion only in the sense that generic and genetically based traits have to be addressed by religion, but the solutions are supragenetic. The identity question has shifted from genetic identity (Chapter 2, Section 1) to religious identity, a nongenetic level. Christians around the world, confessing a common creed, share a cognitive identity. Values – now valuable answers – are getting shared again, rather than being something selfishly defended.

One is no longer dealing with just the logic of the genes. These religions criss-cross races, nations, and centuries; they operate in diverse times and cultures and involve some logic of the mind that is tracking what is transgenetically right or of value, no matter whether one has this or that set of genes. Genetic success is necessary but not sufficient to explain this universalism. It makes more sense to say that such religions were discovering what is transtribally, transculturally valuable. Something has emerged for which biology is not giving us a convincing account.

The rules change. Values are no longer defended at the level of natural selection, primarily. The value activity is now at a level that is culturally enjoyed and transmitted. The dominant monkey who feeds first and thereby protects his genes in his kindred may indeed be leaving superior monkeys in subsequent generations. But a hu-

man who grabs food from a neighbor is not improving the human genome at all (contributing superior grabbing genes to the gene pool), because the human genome functions in culture, where there are sharing and general educability. The human who shares food with a neighbor, where this contributes to their mutual survival – should this behavior be genetically based and selected for – is improving the human genome. This capacity for sharing behavior is essential in culture where things can be acquired during lifetimes, where values are transmitted nongenetically – knowledge, skills, resources, language, traditions, ideas, scientific discoveries, ethical convictions, and religious beliefs.

What happens in the monkey case and what happens in the human case are radically different conceptually. If humans have some elements of wild nature left in them genetically, these dispositions will frequently remain functional. When one gets hungry, one goes in search of food. But there may be other wild dispositions that humans have to rise above, if they are to rise into culture. Humans may fail to rise to their moral possibilities, fail to share, and lapse into sheer selfishness. Although self-defense is proper and valuable in animals, and proper and valuable also for persons, when self-defense passes over into selfishness, this is improper and disvaluable in culture. Then there will appear what the theologians call sin, and this historic and perennial lapsing has sometimes been called original sin. Religions deal with this tendency; they regenerate humans for successful life in culture.

Such sharing capacities do indeed produce human prosperity (fertility), but tight connections to the genes – this behavior linked to this genetic coding – have been left behind in the exodus from nature to culture. Natural selection is relaxed. By the time one encounters the universal altruism taught in the world faiths, there is no genetic leash at all. Rather, religious values are, to recall words used earlier, being "distributed," "dispersed," "allocated," "proliferated," "divided," "multiplied," "recycled," "shared," deliberately and out of conviction that this is good and right. And if some of these persons say that "God commands this altruism," that this kind of suffering love is divine, there seems no reason yet forthcoming from the biologists to think otherwise. To the contrary, this genesis of religion with its capacity to generate the generous altruism requisite for culture still needs adequate explanation.

4. FUNCTIONAL AND TRUE RELIGION

Religion, then, must function to generate innovative ethical behavior, unknown otherwise in natural history, which makes possible the human genius (*Geist*), which cannot exist outside the social covenant. When this happens, the human genius is still more fertile. Reflective religion comes further to serve the function of explaining the creative genesis in both natural and cultural history, both describing and evaluating it. Such explanations have to work; they are the backing for the ethic. But we must press the further question of whether they also need to be true. Religion can generate ideologies that help persons cope. Religion can generate altruism sufficient for cultural survival. Can religion generate truth? Is that too part of the human genius?

For a pragmatist there is no further question, since whatever works is ipso facto true. Our question is more realist, about facts as well as functions. Since we believe that the genesis needing explanation in both nature and culture is the actual fact of the matter, events that have taken place in history, we also seek an accurate explanation and evaluation. Is it also the fact of the matter, the way things are, to say that God is in, with, and under such genesis? We first look at some doubts, en route to a more positive conclusion.

(1) Survival Value with and without Truth

"Traditional religious beliefs have been eroded, not so much by humiliating disproofs of their mythologies as by the growing awareness that beliefs are really enabling mechanisms for survival" (Wilson 1978, p. 3). That is a rather strange disproof itself.

1. If S (survival-enabling), then not T (true).
2. S.
3. Therefore not T.

The logic is valid, but are the premises sound? Religious beliefs enable survival in the general sense of helping people manage over the generations, as no one wishes to deny, although we just also concluded that religious universalism extensively overreaches the genetic survival of particular practitioners. So the second premise is

half-true. Meanwhile the first premise is curious in its connecting of coping with untruth.

If eyes enable humans to cope, then what they see is not true.

If ears enable humans to cope, then what they hear is not true.

If mathematics enables humans to cope, then what this calculates is not true.

If medicine enables humans to cope, then medical theories are not true.

If science enables humans to cope, then science is not true.

If ethics enables humans to cope, then ethics is not true.

If religion enables humans to cope, then religion is not true.

The presumption, usually, is that survival-enabling mechanisms track something there in the world – eyes seeing a predator, ears hearing a friend, mathematics balancing income and expenditures, science making a medicine that kills germs, ethics distributing resources fairly. This presumption has to be overridden in religion. Anomalously, religion is a coping myth.

Neither perception nor conception is infallible; both are often true at a native range from which one cannot extrapolate too far. The eyes see what is there (trees, tigers, houses), but also what is not there (the flat earth, setting sun, green trees, blue sky); sometimes a superficial correctness is at depth illusory. Appearance is not reality. Even science, as philosophers constantly warn nowadays, is pragmatic and not ultimately descriptive, not descriptive of anything ultimate. Humans frequently know how to manipulate things with little knowledge of what is really going on, as when people bake bread with no idea of the chemistry involved.

Still it is hard to see how science makes medicines that kill germs unless the germs are there and the drug in fact is toxic to them. Some scientists do know the bread chemistries. Humans know about many events rather far removed from our native range – astronomical ones, such as a round Earth orbiting a sun, or supernovae, and microscopic ones, such as DNA coding and covalent bonding. Such knowledge partly is and partly is not survival-enabling; it partly retains and partly modifies native-range impressions that are survival-enabling. So, although it does not demean a science to realize that it has survival value, the relation between truth and survival value is; not straightforward even there.

It is reasonable to begin with the assumption that acting on true

beliefs will bring success. If I believe rightly that there are deer in the valley and go there to hunt them, I may well succeed. If I believe wrongly, I will fail. Even on the pragmatic theory, survival selects for native-range truth. Scientists need descriptive truth when they go after the world, just as much as hunters who go after deer. There is no cause to expect that whatever meets the needs of practice is going to be theoretically wrong.

Ruse thinks that even mathematics just conveys survival advantage. "The human who believes that ' $2 + 2$ ' *really* equals '4' is going to act upon it without question, as are his/her fellows. And this will give them a selective advantage over those who question the basic premises of logic and mathematics, sometimes disobeying them." This is the way it is, but it might have been otherwise. "Selection cares only about keeping us alive and our passing on of our genes. . . . Thus, if we benefit biologically by being deluded about the true nature of formal thought, so be it" (1986, p. 172). But can we imagine that humans who randomize for the outcome of $2 + 2$ might have been selected for? Or that those prosper who, in the interest of equity, rotate the outcome through 1 to 10 on successive days? Hardly, because these procedures are logically wrong, and therefore they will fail in empirical application. It is implausible that life should have evolved a bad computational logic that is a good adaptive fit. A theoretically mistaken mathematics might meet the needs of practice, if it nevertheless provided good approximations, but not if the formal mistake really misinformed the practice.

Those who cope well need a worldview that represents rather reliably what the world is like, at least those sectors of it through which they have to move. There cannot be too much gap between appearance and reality. That works with sense perception, with science, even in ethics at everyday empirical ranges. People use religion too to operate at everyday empirical ranges. Nevertheless in religion a problem arises because a modern person, whether monotheist believer or secular scientist, will soon enough encounter beliefs that seem to enable persons to function reasonably well that bear no resemblance to world facts. Even believers in the monotheist God of Judaism and Christianity have a lot to explain away in the enormous variety of "pagan" beliefs and practices. Shinto believers held that the emperor was descended from the sun goddess; an Australian Aranda may think he is descended from the kangaroos. Divinely descended leaders and totemism may inform practice successfully,

but both are misinformed theoretically. How can it be that in religion, unlike mathematics, misinformation forms successful practice?

Darwin found himself beset by "the horrid doubt" whether the convictions of a man's mind are any more trustworthy than those of a monkey's mind (Chapter 4, Sec. 7). But there is every reason to trust a monkey's mind about whether raptors, snakes, or tigers are present. There is every reason to trust any creature's mind in the niche in which it is adapted to survive. The human niche is culture as well as nature. When one finds that human minds are disposed to beliefs of both conscience and religion, what then? We are first inclined to trust such minds and then startled to find them full of ideas that seem incredible. How can this happen?

C. S. Peirce claims:

Logicity in regard to practical matters. . . is the most useful quality an animal can possess, and might, therefore, result from the action of natural selection; but outside of these it is probably of more advantage to the animal to have his mind filled with pleasing and encouraging visions, independently of their truth; and thus, upon unpractical subjects, natural selection might occasion a fallacious tendency of thought. (1960, vol. 5, sec. 366)

Lionel Tiger adds: "Optimism has been central to the process of human evolution. . . . Making optimistic symbols and anticipating optimistic outcomes is as much a part of human nature, of the human biology, as are the shape of the body, the growth of children, and the zest of sexual pleasure" (1979, p. 15; cf. Taylor 1989). Arnold Ludwig agrees: "Fantasy, then, often represents a convenient way for man to temporarily lie to himself in order to make life more palatable" (1965, pp. 179).

Now the logic is different:

If a practical matter, then thought must be accurate (true).

If an impractical matter, then thought must be pleasant (not true).

The animal knows the truth when it is vital; the animal feels good when it isn't important; this combination is better for survival than truth all around. It is as though the animal operates in the real world by day and has pleasant dreams at night, which relax it for work again the next day.

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If a scientific matter, then thought must be accurate (true).

If a religious matter, then thought must be pleasant (not true).

A problem with this account is that any religion so explained has to be impractical, and there is no evidence that religion is unimportant or irrelevant in the lives of these myriad believers. To the contrary, their life practices are oriented by religion. Almost by definition, religion is what one is "bound to" (Greek: *re-ligio*, redoubled binding). The biologists have been insisting that religion has survival value just because it congeals group loyalty, demands short-term sacrifices in the interests of long-term benefits, offsets biological self-interest to develop the more altruistic virtues necessary for culture, results in more offspring in the next generation, and so on.

If Cinderella thinks about mice in the pantry, she must be accurate.

If Cinderella thinks about Prince Charming, she must be pleased.

Religion is a Cinderella story that helps girls function when scrubbing the floors, it fulfills Cinderella's psychological "needs," but it is really out of touch with reality. Here she needs a pleasant appearance that veils her harsh reality.

So, to project the Cinderella parable into metaphysics, the world is really harsh and meaningless, but we humans invent religions to save us *from* the truth, rather than to help us discover the real truth. Here people need to get it wrong. Religiously, we need an illusion in order to keep our spirits up, though practically, we must have correspondence between appearance and reality in order to operate successfully (Rue 1994). Practically, Cinderella needs a science to tell it like it is; mythically, she needs a religion to tell it like it isn't.

If that is true, science is bad news, eroding these traditional mythologies, as Wilson thinks it does. Science is disabling these enabling mechanisms, and how can humans then survive, so disabled? So science, which we have earlier found to be quite enabling for survival, is now discovered to be only penultimately so, and ultimately disabling. Fortunately, or unfortunately (?), scientists, who get it right, are likely to be disabled most, and those who continue the traditional mythologies, and get it wrong, will outreproduce them!

Meanwhile, Peirce's account fails to reckon with how religion has to be functional in society corporately, not just provide a relaxing

dream for individuals at night or on Sundays when there is no work. Cinderella has to relate to her stepmother and sisters religiously and thereby to manage in her real world, not just the imaginary one of her dreams. That is where her real, social need fulfillment must take place. Prince Charmings come rarely or never. Religion cannot be just episodic retreats from reality. Religion too has to keep her in contact with reality; she must return to the operating world and work there practically. Humans do have to get some values right, if they are to succeed, and young girls who wait around for handsome princes to rescue them have few actual needs fulfilled and even fewer offspring. Fantasy is seldom functional. People who are wrong about causal connections (bad science) will fail, but people who are wrong about what is valuable in the world (bad religion) will just as surely fail.

Religions do need to distinguish between ideal and real (which is not the same as appearance and reality). Often persons need an ideal toward which they reshape the real. It can certainly be adaptive to have ideals to which one aspires, even if one falls short. All of us are like that, in our better moments. That is what makes us better. Religion and ethics both prescribe what ought to be even when it isn't, as well as describe what is. The question turns around what these ideals are. If the sociobiologists and evolutionary psychologists are right, the ideals, sooner or later, tacitly if not explicitly, are the most offspring in the next generation. But we have been recognizing various other ideals ("myths") – universal love, evangelism, redemption, self-actualizing, justice, fairness, honesty – that seem maladaptive for maximizing offspring. Perhaps Cinderella thought her rights were being violated. If she could assert her rights, she would probably have more offspring, and religion might support human rights.

Humans absolutely must get their social functioning act together. A religion has to have enough realism about the human condition, real and ideal; about the values that motivate persons to behave in interpersonal relationships; about parenting responsibilities; and so forth, to get a whole society from one generation to the next, and the next, across generations. There is nothing impractical about that. Fairy tales, like fables, embody occasional bits of wisdom, but can you operate a whole society on fairy tales and other pleasant fantasies? What one really needs to examine is the relationship between this social functioning, necessary for any persisting religion, and its truth.

(2) Testing Religions Socially

This is not a problem first conjured up by the biologists; the sociologists have been troubled by it for years – although not in the genetic form. Religions have regularly claimed that they were good for the well-being of society. Finding such a connection is, ipso facto, no cause to cease to behave religiously. To the contrary, it is an excellent reason to continue observance. One's reasons for observance might be weakened, though, if it were shown that observance is "nothing but" behavior for the good of society, that is, that there is no further reason to think that any of these beliefs is true.

Those reasons will have to come from some other dimension of human experience and will force asking whether functioning is a test for truth in religion. Can there be functional religions that are not true? Can there be true religions that are not functional? What is one to make of the error in religion? To be wrong in religion seems to mean more than just not functional. For it is certainly true that religion has been (and often continues to be) filled with beliefs that no scientifically minded person can seriously entertain to be true, and that these beliefs are sometimes more or less functional.

What separates out religion as anomalous, is the feeling, by modern persons, that the religions just cannot all be true – they are too diverse, conflicting, and fantastic – so one must look for some other account of them, which preserves their functionality without requiring their truth. Humans with their eyes and ears, humans with their mathematics and sciences, reach much consensus on what is true, but in philosophy, in ethics, and especially in religion, they do not. Wilson cites with approval Anthony F. C. Wallace's estimate that humans have produced 100,000 religions (Wallace 1966, p. 3; Wilson 1978, p. 169). If there are that many they all must really be the same thing, some essence beneath the fluff; the explicit cognitive claims cannot be right; there must be a tacit, functional explanation. Like a kaleidoscope that produces 100,000 patterns with a simple mirror arrangement reflecting the contingent falls of bits of glass, there is really only one mechanism driving religion, and the particulars are frills on the universal.

Animals that misperceive their environments do not survive; an adapted fit cannot be based on false information about the world. But with animals there is no problem with conflicting worldviews: the deer are unanimous about whether that is an approaching pan-

ther, whether it is dangerous, and which direction it is coming from. Even humans are unanimous about such empirical facts. But humans differ widely in their worldviews, and they cannot all be right about these. "The enduring paradox of religion is that so much of its substance is demonstrably false, yet it remains a driving force in all societies. Men would rather believe than know." It is hard to believe that "such force could really be extracted from 'a tissue of illusions'" (Wilson, 1975a, p. 561). The solution is that religion, though a tissue of illusions cognitively, is a strange kind of error that evolution promotes, since the outcome of religion that is visible to natural selection is its survival value, and natural selection selects for that, regardless of truth.

Can evolution promote error? Usually no, but sometimes yes. There can be myths that insulate, pacify, sedate, or unify; stimulate, inspire, or engender other useful behaviors. The anomaly is that such a fantastic point of view results in an adequate response to the environment. It is as though humans live in a bad world – one where they must all compete with each other genetically and for resources, where nature is red in tooth and claw, where they must band together selfishly yet also cooperatively in culture, where they will all eventually lose. Paradoxically, this world is so bad that only the optimistic will survive. Usually, you can function well only if you know the truth about your world, but here you can only function well if you do not. So one must be deceived to succeed. This becomes a self-fulfilling prophecy. Those who believe the gods are on their side make it through. The realists, if there are any, go extinct. If this is true, then one might ask whether we want to know otherwise. These biologists will not be bringing us a truth that sets humans free, but a truth that triggers our extinction.

This is such an anomaly that one will want to examine the paradigm that is framing it. Perhaps this anomaly is only an artifact of a particular theory. Such a picture comes from selfish genes, random variation, blind selection, evolutionary history as a random walk, survival of the fittest, and so forth. But there is the alternative account: of widely distributed and conserved (shared) values both in nature and in culture. There are dimensions of struggle, suffering, and tragedy in this picture too, but there are genesis and creativity, generation and regeneration. Accompanying a human exodus from nature into culture, some religious persons discover, over time, the virtues of cooperation and altruism that make culture possible (more

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sharing). Some of them detect the divine in their midst endorsing such virtue. From this perspective we have not really been given any reason to think that those who make these sorts of claims in religion, though survival-enabling, are not right because they have too rosy an account of the bleak world. Whatever account one may have to give of the many myths in religion, in this part of it, about the divine will in, with, and under the socially functional and universal altruism, we are getting a dash of philosophical views. These views are being superimposed on the facts; indeed people are seeing differing facts as a result of differing interpretive gestalts.

We need a better account of whether there is sometimes cognitive truth in religion, and, if there is, whether such truth might not be quite compatible with survival value. Then one might be in a position better to understand why and how such believers not only make it through but evangelize others.

(3) Testing Religions Cognitively

Are all the 100,000 religions just turns on a socially functional kaleidoscope, with the differences between them insignificant? That might be true of many religions, but there is something more to be said. The religions that have spread worldwide, that persist and develop over the centuries, are quite few: about ten religions form the chapters in a typical world religions textbook. So all are not equally socially functional on a world scale; less than a dozen were exported outside their originating tribes to become global faiths. What account is one to give of the few that were?

We are confronting universalism again, now in religion as well as in ethics, and wondering whether the universalism in the ten survivors is just more covert social functioning promoting covert genetic survival, from which one must dismiss any cognitive content as irrelevant fluff. Perhaps this long-continuing, ever-widening social functioning is linked to some insightful cognitive content, especially where the classical religions are so anomalously transtribal and transgenetic.

An alternative account, recalling the "generate and test" model, holds that the 100,000:10 selection effect has been a trial-and-error learning process. The creeds (theories) that remain have survived because they have a good deal of corroboration and have not yet been falsified. They have a staying power in the face of arguments

and evidence. Analogously, humans have produced 100,000 theories in science, of which, again, perhaps 10 are leading survivors (relativity theory, quantum theory, atomic theory, the chemical periodic table, the geological epochs and cycles, plate tectonics, evolutionary theory). There is a consensus on such scientific theories not yet reached by the remaining, often competing religions. Nevertheless, the winnowing of religions is a testing by which some survive and others do not. Mostly, there are chaff, dross, noise, but sometimes there are grain, gold, information.

Along the diverse routes of religious development, humans will often have constructed beliefs that are functional in some local and limited context, though they are not true. Sometimes erroneous scientific theories stayed around quite a while (fixity of species, spontaneous generation of life, phlogiston), but eventually better ones supplanted them. The better adapted survived – that is, the better ones with which to adapt survived – and we also believe that the prevailing theories are more approximately true. The history of astronomy is beset with astrology, the history of mathematics is beset with curious numerology, and it will not discredit all religion to find such things as demonology, angelology, and superstition in some of it. One can employ a developmental, trial-and-error, generate-and-test account of religion too. Often these trials will work briefly, or in elementary circumstances. But they will not survive the cross-critical sifting that the world religions do manage to survive.

The process is generate and test again, but this time it is also regenerate and test. What is tested now is not genes, not just hypotheses, but persons who embody creeds, who may be "saved" as those creeds inform appropriate behavior for managing in the world. One does not want to dismiss the survival-enabling component, but to search for an appropriate lived experience that lives successfully in the world because it detects the bigger forces operating there, as a compass detects invisible global forces. The fantasies will be selected out in critical insight into what really orients in the world, and these tested (and true) insights will cumulate over the millennia of the religious heritages. Once again, natural selection is relaxed, this time in favor of religious selection. Believers, like ethicists and scientists, must have offspring, but believers have to have disciples, whether their children or proselytes, whom they can persuade to adopt the style of life their religion commends.

Some religious claims that are functional will perhaps remain long

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in place because these conserve what some local society values, uncontested by any rival claims. As long as such a claim stays isolated, it can be retaught over generations; perhaps no indigenous believer has the imagination to challenge it. Natural selection in wild nature often leaves locally endemic species in odd niches, surviving more by isolation than by competitive success.

But when such once-isolated claims do face challenges, in the conflict with missionary arrivals, or in the dialogue of world faiths, or in the effort to proselytize others with differing faiths, or in the encounter with science, the functional test is no longer good enough. The naive religious claim must meet skeptics, resist invasion, invade the status quo, displace vested interests, win debates, regenerate sinners, as well as make better parents. The claim must have rational defensibility proportionate to relevant evidence; it must deploy to cover an expanding set of evidence. That has been the core problem with the myriad nonexportable indigenous faiths. None of their theses could survive the onslaughts of ecumenical criticism. Thus Shinto never left Japan, nor could it; and the Australian Aranda who thinks himself descended from the kangaroos has convinced no one outside tribal Australia. Those beliefs vanish in the modern world because they cannot make converts.

Only the universalist, synoptic creeds have proved exportable, globally functional, because they speak to the common condition of humankind, a necessary condition of success. They do not simply offer fertility, nor even doing well in life, if this means survival. They offer persons the promise that they can understand the fundamental structure of reality (what *is*) and tap powers here for the redemption of life in its brokenness (what *ought* to be). They invite critical self-assessment and reformation; they promise enlightenment and freedom. And they are tested against each other in the fulfillment of these promises. Of the functional faiths, only those with the theses that are the most defensible rationally, as well as the most operational experientially, and those that give life the most meaning, are competent to survive.

Kitcher concludes:

Just as a detailed history of arithmetical concepts and counting practices might show us a succession of myths and errors, yet would not lead us to question the objectivity of the arithmetical statements we now accept, so too reconstructions of the historical development of ethical ideas and practices do not preclude the

possibility that we have now achieved a justified system of moral precepts. Wilson is far too hasty in assuming that the evolutionary scenario he gives for the emergence of religious ideas – a scenario that stresses the adaptive advantages of religious beliefs and practices – undercuts the doctrine that religious statements are true. Even if Wilson's scenario were correct, the devout could reasonably reply that, like our arithmetical ideas and practices, our religious claims have become more accurate as we have learned more about the world. (1985, p. 419)

Wilson mentions religious systems of morality only to dismiss them; his reason is spurious. "If religion... can be systematically analyzed and explained as a product of the brain's evolution, its power as an external source of morality will be gone forever." The argument turns on a critical ambiguity. If religious concepts are nothing but products of our brains, then, of course, religion is just a story. If, however, the history of religious belief shows human beings gaining knowledge of entities that actually exist, then there are no grounds for Wilson's conclusion. . . . There is no quick argument for debunking religion (or mathematics) on the grounds that it has a checkered history. (1985, p. 424)

Every set of human ideas – science, ethics, religion, or whatever – has a history that connects with the brain that has evolved, that has been used for building a culture and getting along in the world, but what one wants to know is whether some of these ideas, gained with this evolved brain, are true and correct and others false and incorrect.

The basic theoretical model is variation, selection, and retention. Biology uses one version, naturalized in genetics. Religion, as does science, uses a socialized version that goes beyond genetics. Not only is all religion culturally transmitted, but some is transmitted by universal proselytizing, urging universal altruism. The first round of selection is pragmatic, socially functional survival value, but the second round of selection is critical and cognitive. Both rounds are evaluative, testing a religion for what it is worth. The only ones that are able to survive and flourish over the millennia are the universal ones, able to win by proselytizing and universal altruism. That does not sound like *selfish* genes. It sounds like truths that have got loose transgenetically and are being *shared* around the world, that is, in the religious imagery, truth that is "blessing" all nations.

We first think that function is underdetermining truth, but the truth may rather be that progressively powerful functioning is corroborating truth. There is nothing particularly biological about a cull-

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ing process that generates and tests variations on religion, any more than there is about a similar systematic methodology in science or ethics. Indeed it seems counter-genetic when a principal criterion for a religion's survival is a universal scope that discredits the tribal religions that have been unable to generate exportable, globally true theses.

5. GENESIS AND GOD

There is a metaphysical version of the if-functional-then-not-true argument. Wilson argues that if something has evolved in natural history, then it cannot be the work of transcendent deity.

1. If E (evolved), then not T (transcendent).
2. E.
3. Therefore not T.

"No species, ours included, possesses a purpose beyond the imperatives created by its genetic history. . . . We have no particular place to go. The species lacks any goal external to its own biological nature" (1978, pp. 2-3). "There is no transcendental guide or extra-somatic set of universal principles to follow" (Wilson 1980a, p. 70). As before, the logic is valid, but are the premises sound? "If x emerged in historical time, then x is not divine"? If from genes, then not from God?

That fails to consider whether one purpose of God might be this Earth history: the creation and its redemption. This amounts to claiming, in the traditional vocabulary of theologians, that immanence cannot combine with transcendence, that the beyond cannot be in our midst. Theologians almost unanimously think otherwise, on the evidence of religious experience, critically evaluated. So one will need to know what it is about biology, about genetics, that authorizes this conclusion that the historical cannot be the immanent location of a transcendent divine presence. We humans do not particularly want some goal "external to our biological nature"; we wish one consistent with it, but we might want to maintain that, metaphysically, neither our biological nor our sociological natures are self-explanatory.

Wilson insists, "The evolutionary epic is probably the best myth we will ever have" (1978, p. 201). We agree, but the question is whether the dramatic events on this Earth contain no hint of larger,

more universal powers in which they are embedded. Perhaps, rather, culture and biology are finding out in their historical domains what Kurt Gödel found for the much simpler domains of mathematics and logic, that systems to be completely understood require reference to other systems at a higher level of organization. Against the reductionists, religious persons have to be compositionists, to move up, not down, to get the interpretive level needed to frame and complete lower level truths. Nature and history have been creative, making more out of less. The essential characteristic of narrative is that events have to be understood in the light of the complexities to which they lead, not just in the light of the origins from which they flow. The event structures toward which things climb, their endings, are as significant as the matter-energy out of which they arise, their beginnings.

We have no cause to think that the startling genesis on Earth, recorded in the genes, recorded in the cultural heritages, including the religions, is not sacred; nor that humans, funded by their evolved perceptual and cognitive equipment, can never detect that sacred presence. The idea of God has been among the most fertile in shaping history. That is the fertility that ultimately needs to be explained.

That returns us to the global claims of religion, claims that are transcendent at least in the sense of detecting a divine power in, with, and under the genesis on Earth. Contra Wilson, does biology leave space for such claims or even invite such claims as complementary explanations? Genes record only a portion of the history that has taken place: they do not, for instance, record the prelife cosmological story; nor do they record the postgenetic cultural story. Still, vital to the Earth epic is this fertility intimately linked with the genes, the means by which all the more complex structures on Earth, living things, are formed. There are no such genes on the moon, nor Jupiter, nor Mars. Genes remember, research, and recompound discoveries, and the storied achievements, the values achieved, rise, over several billion years, to spectacular levels of attainment and power. The cosmic universals give way to the particulars of Earthen natural history.

(1) Actual and Possible Natural History

What can we say about how the possible becomes actual over evolutionary time? Here, one must increasingly pass from bioscience to

metaphysics. We return, at the end, to questions faced earlier, about the increase of complexity and diversity, about contingency and inevitability in such increase, about progress, now with questions looming about the possibility of divine presence. This is the fertility question in its metaphysical form, the generation of the actual out of the possible, and the generation of those possibilities, and even a Generator of such possibilities. The possibility route to be found is not so much logical, or empirical, or even physical; it is historical. What possibility spaces are needed to get from beginnings to where we have now arrived, in Earth history?

At the other extreme from those emphasizing the contingency, there are eminent biologists – though they tend to be molecular biologists rather than paleontologists – who find this storied natural history to be inevitable, at least in outline, and therefore predictable. Christian de Duve concludes: "Life was bound to arise under the prevailing conditions, and it will arise similarly wherever and whenever the same conditions obtain. There is hardly any room for 'lucky accidents' in the gradual, multistep process whereby life originated." After life arises there is contingency as to its directions and species, but this is "constrained contingency" so that the general trends in the development of life – cellular organisms, multicellular organisms, solar energized organisms, increasingly diverse and complex organisms, and intelligent organisms – are likewise inevitable. "Life and mind emerge not as the results of freakish accidents, but as natural manifestations of matter, written into the fabric of the universe. I view this universe [as] . . . made in such a way as to generate life and mind, bound to give birth to thinking beings" (1995, pp. xv-xvi and xviii).

"This universe breeds life inevitably," concludes George Wald (1974, p. 9). Life is an accident waiting to happen, because it is blue-printed into the chemicals, rather as sodium and chlorine are preset to form salt, only much more startlingly so because of the rich implications for life and because of the openness and information transfer also present in the historical life process. Whatever place dice throwing has in its appearance and maturation, life is something arranged for in the nature of things. The dice are loaded.

When the predecessors of DNA and RNA appear, enormously complex molecules appear; bearing the possibility of genetic coding and information, they are conserved, writes Melvin Calvin, "not by accident but because of the peculiar chemistries of the various bases

and amino acids. . . . There is a kind of selectivity intrinsic in the structures." The evolution of life, so far from being random, is "a logical consequence" of natural chemistries (1975, pp. 176 and 169). Manfred Eigen concludes that "the evolution of life . . . must be considered an *inevitable* process despite its indeterminate course" (1971, p. 519; 1992). Life is destined to come as part of the narrative story, although the exact routes it will take are open and subject to historical vicissitudes. Kauffman agrees: "I believe that the origin of life was not an enormously improbable event, but law-like and governed by new principles of self-organization in complex webs of catalysts" (1993, p. xvi; 1995).

Such accounts suggest that the possibilities are always there, latent in the physics and chemistry, although the resulting Earth history is not so "fine-tuned" as astrophysics and nuclear physics have found in their cosmologies. But even in Earthen biology, the possibilities must, or almost must, become actual. Alternately put, there are few possibilities beyond those that do actualize. But of course all such possibilities are seen only retrospectively. What does happen, can happen. But we are wondering how it comes about that these events can happen. If, *per impossibile*, some scientist had under observation the elementary particles forming after the first three minutes, nothing much in them suggests anything specific about the coding for life that would take place, fifteen billion years later, on Earth. After Earth forms, the lifeless planet is irradiated by solar energy, as are other planets as well. The events in physics and chemistry there are to a considerable extent lawlike and predictable, at least statistically, although in geology and meteorology the system is quite complex as a result of shifting initial conditions, possibly even at times chaotic. Still, in orogeny and erosion, or the shifting of the tectonic plates, the possibilities always seem there.

At the microscopic levels, quantum physics depicts an open system and nested sets of possibilities, but, at first, all the atoms and molecules take nonliving tracks. Only later do some atoms and molecules begin to take living tracks, called forth as interaction phenomena when cybernetic organisms appear. If there is some "inside order" to matter that makes it prolife, it is in the whole system and not just in the particles. Despite the anthropic principle, such order is not generally evident in the systemic astronomy, since by far the vastest parts of the universe are lifeless. Life is an Earth-bound probability. Nor, on Earth, are the meteorological or geomorphological systems

all that suggestive of inevitable life. They mostly seem kaleidoscopic variations on geophysical and geochemical processes.

Only in biology do there open up entirely unprecedented levels of achievement and power. Such possibilities are not inside the atoms and molecules apart from their systemic location, since atoms and molecules would not even be collected into a "thin hot soup" except for the Earth world in which this is possible, nor can this or that sequence of DNA code for anything unless there is an environment in which to behave this way or that, with a niche to fill. Even if there is some "selectivity intrinsic in the structures/" this does not rule out a universe of myriad options, only some of which are realized.

Physics and chemistry, unaided, do not get us very near to life and mind. There really isn't much in the physics and chemistry of atoms and molecules, prior to their biological assembling, that suggests that they have any tendencies to order themselves up to life. Even after things have developed as far as the building blocks of life, there is nothing in a "thin hot soup" of disconnected amino acids to predict that they will connect themselves or be selected along upward, negentropic though metastable courses into proteins, nor that they will arrange for DNA molecules in which to record the various discoveries of structures and metabolisms specific to the diverse forms of life.

All these events may occur naturally, but they are still quite a surprise. Recent microbiology has been revealing their enormous complexity. We do not know that life, if it occurs on some other planet, there built too of the same atoms, must select these same biochemistries, although the amino acids found on meteorites and the prebiotic molecules guessed to be present in interstellar dust clouds can suggest that the potential for life is omnipresent in matter. Laws are important in natural systems, whether extraterrestrial or terrestrial. But natural law is not the complete explanatory category for nature, any more than are randomness and chance. In nature, especially on this historical Earth, there is creativity by which more comes out of less.

Science does not handle historical explanations very competently, especially where there are emergent novelties; science prefers lawlike explanations in which there are no surprises. One predicts, and the prediction comes true. If such precision is impossible, science prefers statistical predictions, probabilities. One predicts, and, probably, the prediction comes true. Biology, meanwhile, though prediction is of-

ten possible, is also full of unpredictable surprises – like calcium endoskeletons in vertebrates after millennia of diatomaceous silica and chitinous arthropod exoskeletons. A main turning point in the history of life fused once-independent organisms into the cell and its mitochondria, which became the powerhouses for life. Another critical symbiosis introduced free-living chloroplasts into the plant cell, again producing the energy vital for all life.

There is no induction (expecting the future to be like the past) by which one can expect, even probably, trilobites later from prokaryotes earlier, or dinosaurs still later by extrapolating along a regression line (a progression line!) drawn from prokaryotes to trilobites. There are no humans invisibly present (as an acorn secretly contains an oak) in the primitive eukaryotes, to unfold in a lawlike or programmatic way. The ancient ancestral forms are not protovertebrates or preterrestrials, nor are gymnosperms about-to-be angiosperms, as though the descendant forms were latent among the functions of the predecessors. Originating events often become what they become only retrospectively: "Vertebrates began (possibly) with the notochords of primitive chordates." "Eyes began with . . ." Nevertheless, there is the epic story – eukaryotes, trilobites, dinosaurs, primates – swarms of wild creatures in seas and on land, followed by humans who arrive late in the story.

Making this survey, can one insist that the probabilities, or at least the possibilities, must always have been there? Can one claim that what did actually manage to happen must always have been either probably probable, or, minimally, improbably possible all along the way? Push this to extremes, as one must do, if one claims that all the possibilities are always there, latent in the dust, latent in the quarks. Such a claim becomes pretty much an act of speculative faith, not in present actualities, since one knows that these events took place, but in past probabilities always being omnipresent. Is the claim some kind of induction or deduction, or most-plausible-case conclusion from present actualities? Speculation about such possibilities that are always there is easy, provided one does not have to specify any of the details. But this perennial and vast library of possibilities is mostly imaginary.

For in fact, on Earth, there really isn't anything in rocks that suggests the possibility of *Homo sapiens*, much less the American Civil War, or the World Wide Web, and to say that all these possibilities are lurking there, even though nothing we know about rocks, or

carbon atoms, or electrons and protons suggests this is simply to let possibilities float in from nowhere.² Unbounded possibilities that one posits ad hoc to whatever one finds has in fact taken place – possibilities of any kind and amount desired in one's metaphysical enthusiasm – can hardly be said to be a scientific hypothesis. This is hardly even a faith claim with sufficient warrant. It is certainly equally credible, and more plausible, and no less scientific to hold that new possibility spaces open up en route.

Karl Popper concludes that science discovers "a world of propensities," open to historical innovation, the possibility space ever enlarging.

In our real changing world, the situation and, with it, the possibilities, and thus the propensities, change all the time. . . . This view of propensities allows us to see in a new light the processes that constitute our world: the world process. The world is no longer a causal machine – it can now be seen as a world of propensities, as an unfolding process of realizing possibilities and of unfolding new possibilities. . . . New possibilities are created, possibilities that previously simply did not exist. . . . Especially in the evolution of biochemistry, it is widely appreciated that every new compound creates new possibilities for further new compounds to synthesize: possibilities which previously did not exist. The possibility space... is growing. . . . Our world of propensities is inherently creative. (1990, pp. 17-20)

The result is the evolutionary drama. "The variety of those [organisms] that have realized themselves is staggering." "In the end, we ourselves become possible" (1990, p. 26, p. 19).

But – the reply comes – since all those things did come in subsequent evolutionary and cultural history, their possibilities must have been there all along. You were not listening when we discovered that matter is self-organizing, autopoietic. That posits enormous possibilities, there from the start, and nothing in the historical drama ought to take by all that much surprise one who believes in self-organizing nature. Thomas R. Cech, a molecular biologist, reviews the origin of life:

If intrinsic to these small organic molecules is their propensity to self-assemble, leading to a series of events that cause life forms

² Against the caution of Alfred North Whitehead (1929, p. 46).

to originate, that is perhaps the highest form of creation that one could imagine. . . . At least from the perspective of a biologist, I have given an account of how possibilities did, in times past become actual. When this happened, life originated with impressive creativity, and it does not seem to me that possibilities floated in from nowhere; they were already present, intrinsic to the chemical materials. (1995, p. 33)

True, matter – energized as it is on Earth – is now self-organizing. But that leaves open the question whether, on the adaptive landscapes on which organisms struggle to increase their fitness for survival, landscapes which themselves shift as the organisms make their discoveries, there are changing possibility spaces coming in through evolutionary history. In creating themselves, the creatures need possibility space, opportunity space, transformational space. Evolving into *Homo sapiens* is, we can suppose, in the possibility space of *Homo habilis* (or whatever the hypothetical ancestor). But it takes considerable imagination to find *Homo* in the possibility space of trilobites (or whatever the remote ancestor in that epoch). The creatures do have, over time, the possibility of speciating and respeciating. But it is not so clear that the creatures, in their self-actualizing, do have, or generate all by themselves, all these other kinds of selves into which they are transformed. There is enormously more out of less, and enormous space for the introduction of novelties that do not seem "up to" the faculties of the organism. One can say, if one likes, that a dinosaur is lurking in the possibility space of a microbe, or that microbes self-transform into dinosaurs, which self-transform into primates. But that really is not a claim based on anything we know about the biology or ontology of microbes.

The self-creating is more a holistic, systemic affair; it is what happens to microbes when they are challenged in their habitats and after a very long time. This requires the creation of new possibility spaces. From a God's-eye view, perhaps the possibilities are always there,³ but we humans have no such viewpoint. We do view results and know that the possibilities both got there and got actualized, but it is quite as much an act of faith to see dinosaurs in the possibility spaces of quarks as to see dinosaurs in the possibility space of God.

³ "My frame was not hidden from thee, when I was being made in secret, intricately wrought in the depths of the earth. Thy eyes beheld my unformed substance" (Psalm 139.15-16).

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Looking at a pool of amino acids and seeing dinosaurs or *Homo sapiens* in them is something like looking at a pile of alphabetical letters and seeing *Hamlet*. In fact *Hamlet* is not lurking around a pile of A - Z's; such a play is not within their possibility space – not until Shakespeare comes around, and in Shakespeare plus a pile of letters, *Hamlet* does lurk. By shaking a tray of printer's type, one can get a few short words, which are destroyed as soon as they are composed. If sentences begin to appear (an analogue of the long, symbolically coded DNA molecules and the polypeptide chains) and form into a poem or a short story (an analogue of the organism), one can be quite sure there are some formative, even irreversible, constraints on the sorting and shaking that are catching the upthrusts and directionally organizing them.

It hardly seems coherent to hold that nonbiological materials are randomly the more and more derandomized across long structural sequences and thus ordered up to life. That is quite as miraculous as walking on water. Something is introducing the order, and, further, something seems to be introducing layer by layer new possibilities of order, new information achieved, not just unfolding the latent order already there from the start in the setup.

Some will reply that all actual events materialize in a global possibility space, and while the former become over time, the latter does not. The possibility space is always there. There is no such thing as the creation of possibilities that were not there. New doors may open but only into rooms that previously existed, albeit unoccupied and with no furniture. One does not need to get possibilities from nowhere because there are infinite possibilities everlastingly, or at least since the Big Bang. The proof of this lies in what has subsequently happened.

But surely the possibility space of serious alternatives does enlarge and shrink. There are times of opportunity, in which taking one direction opens up new possibilities and taking another shuts them out. Along the way, new possibility space for genetic engineering is brought into the picture, and this is linked with the appearance of new information, to which we next turn.

(2) The Genesis of Information

The story becomes memorable – able to employ a memory – only with genes (or comparable predecessor molecules). The story be-

comes cumulative and transmissible. The fertility possibilities are a hundred times recompounded. If the DNA in the human body were uncoiled and stretched out end to end, that slender thread would reach to the sun and back over half a dozen times.⁴ That conveys some idea of the astronomical amount of information soaked through the body. In nature, in the Newtonian view there were two metaphysical fundamentals: matter and energy. Einstein reduced these two to one: matter-energy. In matter in motion, there is conservation of matter, also of energy; neither can be created or destroyed, although each can take diverse forms, and one can be transformed into the other. In the biological sciences, as we have emphasized, the novelty is that matter-energy is found in living things in diverse information states. The biologists still claim two metaphysical fundamentals: matter-energy and information. Norbert Wiener insists, "Information is information, not matter or energy" (1948, p. 155).

In living things, concludes Manfred Eigen, this is "the key-word that represents the phenomenon of complexity: information. Our task is to find an algorithm, a natural law that leads to the origin of information. . . . Life is a dynamic state of matter organized by information" (1992, p. 12, p. 15). Bernd-Olaf Küppers agrees: "The problem of the origin of life is clearly basically equivalent to the problem of the origin of biological information" (1990, p. 170). George C. Williams is explicit:

Evolutionary biologists have failed to realize that they work with two more or less incommensurable domains: that of information and that of matter. . . . Matter and information [are] two separate domains of existence, which have to be discussed separately in their own terms. The gene is a package of information, not an object. . . . Maintaining this distinction between the medium and the message is absolutely indispensable to clarity of thought about evolution. (in Brockman 1995, p. 43)

John Maynard Smith says: "Heredity is about the transmission, not of matter or energy, but of information. . . . The concept of information is central both to genetics and evolution theory" (1995, p. 28). The most spectacular thing about planet Earth, says Dawkins, is this

⁴ Estimated from data in Orten and Neuhaus (1982, pp. 8 and 154).

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"information explosion," even more remarkable than a supernova among the stars (1995, p. 145). And, adds, Klaus Dose,

More than 30 years of experimentation on the origin of life in the fields of chemical and molecular evolution have led to a better perception of the immensity of the problem of the origin of life on Earth rather than its solution. . . . We do not actually know where the genetic information of all living cells originates. (1988, p. 348)

When sodium and chlorine are brought together under suitable circumstances, anywhere in the universe, the result will be salt. This capacity is inlaid into the atomic properties; the reaction occurs spontaneously. Energy inputs may be required for some of these results, but no information input is needed. When nitrogen, carbon, and hydrogen are brought together under suitable circumstances anywhere in the universe, with energy input, the spontaneous result may be amino acids, but it is not hemoglobin molecules or lemurs – not spontaneously. The essential characteristic of a biological molecule, contrasted with a merely physicochemical molecule, is that it contains vital information. Its conformation is functional. With the typical protein, enzyme, lipid, or carbohydrate this is structural, keyed by the coding in DNA. The coding here is information about coping in the macroscopic world that the organism inhabits. The information (in DNA) is interlocked with an information producer-processor (the organism) that can transcribe, incarnate, metabolize, and reproduce it. All such information once upon a time did not exist but came into place; this is the locus of creativity.

Nevertheless, on Earth, there is this result during evolutionary history. The result involves significant achievements in cybernetic creativity, essentially incremental gains in information that have been conserved and elaborated over evolutionary history. The know-how, so to speak, to make salt is already in the sodium and chlorine, but the know-how to make hemoglobin molecules and lemurs is not secretly coded in the carbon, hydrogen, and nitrogen. Life is a local countercurrent to entropy, an energetic fight uphill in a world that typically moves thermodynamically downhill (despite some negen-tropic eddies, and despite irreversible thermodynamics). Thermodynamics need be nowhere violated, because there is a steady "downhill" flow of energy, as energy is irradiated onto Earth from the sun, and, eventually, reradiated into space.

But some of this energy comes to pump a long route uphill. This is something like an old-fashioned hydraulic ram, where the main downstream flow is used to pump a domestic water supply a hundred yards uphill through a pipe to a farmhouse – except of course that the ram pump is deliberately engineered and the "life pump" spontaneously assembled itself as an open cybernetic system several thousand times more complex and several billion years long. Life is a river that runs uphill, and even if it nowhere runs uphill very steeply (if we look at its incremental assembly bit by bit), the river as a whole runs far uphill, and each living creature in the stream is quite highly ordered. Some forces are present, some force, some Force! that sucks order in superseding steps out of disorder. Organisms must be constructed along a long negentropic pathway. This requires the continual introduction of information not previously present.

The central dogma of molecular and evolutionary biology is that random variations are introduced into the replication of this information, that rarely such variations prove beneficial in the sense that they improve performance with the result that more offspring are produced, and that such variations in result increase proportionately in the gene pool. The classical view emphasizes that such variations occur at random and without regard to the needs of the organisms. Contemporary genetics is increasingly inclined to interpret this process as a kind of information search using random variations in problem solving and to see the search space as more constrained by the prior achievements of the organism; nevertheless the random element remains prominent. Here is where possibilities lie and where actual novelties are generated out of such possibilities.

John Maynard Smith and Eörs Szathmáry analyze "the major transitions in evolution" with the resulting complexity, asking "how and why this complexity has increased in the course of evolution." "Our thesis is that the increase has depended on a small number of major transitions in the way in which genetic information is transmitted between generations." Critical innovations have included the origin of the genetic code itself, the origin of eukaryotes from prokaryotes, meiotic sex, multicellular life, animal societies, and language, especially human language. But, contrary to de Duve, Eigen, Calvin, Kauffman, or Cech, they find "no reason to regard the unique transitions as the inevitable result of some general law"; to the contrary, these events might not have happened at all (1995, p. 3). So what

makes the critical difference in evolutionary history is increase in the information possibility space, which is not something inherent in the precursor materials, nor in the evolutionary system, nor something for which biology has an evident explanation, although these events, when they happen, are retrospectively interpretable in biological categories. The biological explanation is modestly incomplete, recognizing the importance of the genesis of new information channels.

The philosophical, metaphysical, and theological challenge, left over after the current scientific accounts, is the query what is the most adequate account of the origin of these information channels and the genetic information thereby discovered. In the course of evolutionary history, one would be disturbed to find matter or energy spontaneously created, but here is information floating in from nowhere. For the lack of better explanations, the usual turn here is simply to conclude that nature is self-organizing (autopoiesis), though, since no "self" is present, this is better termed spontaneously organizing. An autopoietic process can be just a name, like "soporific" tendencies, used to label the mysterious genesis of more out of less, a seemingly scientific name that is really a sort of mystic chant over a miraculously fertile universe.

What is inadequately recognized in the "self-organizing" accounts is that, though no new matter or energy is needed for such spontaneous organization, new information is needed in enormous amounts and that one cannot just let this information float in from nowhere. Over evolutionary history, something is going on "over the heads" of any and all of the local, individual organisms. More comes from less, again and again. A more plausible explanation is that, complementing the self-organizing, there is a Ground of Information, or an Ambience of Information, otherwise known as God.

(3) The Genesis of Value

Another way of interpreting this genesis of information arises from looking at its result: the generation, transmission, and deepening of values. Scientists and philosophers have been much exercised about the generation of values, about how an *ought* comes out of an *is*, but it seems pretty much fact of the matter that, over evolutionary history, values have been generated, startling though this may also be. "Survival value" figures large in evolutionary theory. Something is always dying, and something is always living on. For all the struggle,

violence, and transition, there is abiding value. The question is not whether Earth is a well-designed paradise for all its inhabitants, nor whether it was a former paradise from which humans were anciently expelled. The question is whether it is a place of significant value achievement.

Scientists have sometimes tried to portray nature as a valueless place, and that can seem so in the emptiness of outer space, or the frozen wastes of Antarctica, or the sands of the Sahara. But where there is life, value is always at stake. Once humans might have thought that even biological nature is valueless, with value lighting up as, and only as, humans take an interest in what is going on. But such anthropocentrism has become increasingly incredible in Darwin's century. The same evolutionary science that discovered nature red in tooth and claw discovered the value in teeth and claws, the vitality flowing in the blood, the world as a sphere of the contest of values, generated in this perpetual contest. These biological scientists and their evolutionary and ecological sciences are a witness to the genesis of values, in the biodiversity they describe and wish to protect, in the insights into human origins and possibilities they seek to gain, in the morality they urge, at the same time that their theory is incompetent to warrant, support, or appraise such values.

Evaluating Earth, the appropriate category is not *moral* goodness, for there are no moral agents in nature; the appropriate category is some one or more kinds of *nonmoral* goodness, better called its *value*, its worth. One must evaluate phenomena such as the achievement of diversity and complexity out of simplicity; the discovery of sentience, cognition, experience; the mixture of order and contingency, of autonomy and interdependence. This epic of vital ascent is the rare expression point, on Earth, of a peculiar power in cosmic nature. Something divine is embodied (incarnate) in the story. Any struggle and suffering can only be interpreted in the context of such creativity.

According to a long dominant paradigm, there is no value without an experiencing valuer, just as there are no thoughts without a thinker, no percepts without a perceiver, no deeds without a doer, no targets without an aimer. Valuing is felt preferring by human choosers. Possibly, extending this paradigm, sentient animals may also value, using their teeth and claws, or maybe even plants can value as they, nonconsciously, defend their lives with thorns and propagate their kind with seeds. But, in an evolutionary account, the

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value story becomes systemic, more holistic, ecological, global. Earth is a value-generating system, value-genic, valuable, value-able, that is, able to generate values that are widely "distributed," "dispersed," "allocated," "proliferated," "divided," "multiplied," "transmitted," "recycled," and "shared" over the face of the Earth.

It is true that humans are the only evaluators who can reflect about what is going on at this global scale, who can evaluate what has happened in natural and cultural history, who can deliberate about what they ought to do conserving these events. When humans do this, they must set up the scales, and humans are the measurers of things. Animals, organisms, species, ecosystems, Earth cannot teach us how to do this evaluating. But they can display what it is that is to be valued and evaluated. The axiological scales we construct do not constitute the value, any more than the scientific scales we erect create what we thereby measure.

Humans are not so much lighting up value in a merely potentially valuable world as they are psychologically joining ongoing planetary natural history in which there is value wherever there is positive creativity. Although such creativity can be present in subjects with their interests and preferences, it can also be present objectively in living organisms with their lives defended, and in species that defend an identity over time, and in systems that are self-organizing and that project storied achievements. The valuing subject in an otherwise valueless world is an insufficient premise for the experienced conclusions of those who value natural history. Conversion to an evolutionary and ecological view seems truer to world experience, more logically compelling, better informed.

From this more objective viewpoint, there is something subjective, something philosophically naive, and even something hazardous in a time of ecological crisis, for humans to continue to live (as in an age of science they have often done) as though nature were valueless and everything previously generated in natural history were only to be evaluated relative to its potential to produce benefit for humans. When Earth's most complex product, *Homo sapiens*, becomes intelligent enough to reflect over this earthy wonderland, everyone is left stuttering about the mixtures of accident and necessity out of which we have evolved. But nobody has much doubt that this is, recalling the way that the astronauts phrased it, "a small pearl in a thick sea of black mystery" (Mitchell), "to be treasured and nurtured, something precious that *must* endure" (Collins; Section 1[1]). Almost as if

to dispute Wilson's claim that nothing Earth-bound can be transcendent, Mitchell adds, "My view of our planet was a glimpse of divinity" (Kelley 1988, at photograph 52).

Those axe astronauts, not biologists, but what they see is the home planet, the living planet in all its startling possibilities, of which evolutionary history is the most indisputable evidence. We have earlier heard Edward Wilson celebrating that biodiversity, finding it in its own way "miraculous," and urging its conservation, even when he could find no such divinity. Here again is the fertility, which generates religion. Earth is dirt, all dirt, but we find revealed what dirt can do when it is self-organizing under suitable conditions with water and solar illumination. We will not be valuing Earth objectively until we appreciate this marvelous natural history.

Life persists because it is provided for in the ecological Earth system. Earth is a kind of providing ground, where the life epic is lived on in the midst of its perpetual perishing, life arriving and struggling through to something higher. One may think, as we near a conclusion, that biology produces many doubts; here are two more: I doubt whether one can take biology seriously, the long epic of life on Earth, the prolific fecundity that surrounds us on this planet, without a respect for life, and the line between respect for life and reverence for life is one that I doubt that you can always recognize. If anything at all on Earth is sacred, it must be this enthralling generativity that characterizes our home planet. "The world is sacred." That is the conclusion of even so resolute a naturalist as Daniel Dennett, which not even Darwin's "universal acid" can dissolve, dissolve God though this acid can (1995, pp. 520-521). So the secular – this present, empirical epoch, this phenomenal world, studied by science – does not eliminate the sacred after all; to the contrary, the secular evolves into the sacred. If there is any holy ground, any land of promise, this promising Earth is it.

But then why not say that here, if anywhere, is the brooding Spirit of God? One needs an adequate explanation for generating the sacred out of the secular. Indeed, why not even go on to say that this genesis of value is the genesis of grace, since the root idea in "grace" (Latin: *gratia*) is pleasing, favorable, praiseworthy; essentially, again, the idea of something valuable, now also a given. In this genesis, nature is a sequence of gifts; we are given what has "sprung forth"

⁵ "The flower in the crannied wall – it is a miracle" (Wilson 1992, p. 345).

and find that, in this springing forth, values are created. Whatever else has happened, there has been the genesis of values; each of us is a remarkable instance of that.

"The essence of religion," said Harald Höffding, "consists in the conviction that value will be preserved" (1906, p. 14). That helps us to understand Mayr's remark that most biologists are religious. If one finds a world in which value is given and persists over time, one has a religious assignment. A central function of religion is the conservation of value, and value generated and conserved is the first fact of natural history, as well as the principal task of culture. Frederick Ferré defines religion, "One's religion... is one's way of valuing most intensively and most comprehensively" (1970, p. 11). At the metaphysical level, science neither describes nor evaluates the genesis of value adequately, although the descriptions of biological science – those of evolutionary history eventuating in cultural history – present an account that demands evaluating, intensively and comprehensively. Religion is about the finding, creating, saving, redeeming of such persisting sacred value in the world. In this sense, whatever the quarrels between religion and biology, there is nothing ungodly about a world in which values persist in the midst of their perpetual perishing. That is as near as Earthlings can come to an ultimate concern; such benefit, such "blessing," is where, on Earth, the Ultimate might be incarnate.

(4) Detecting the Transcendent

The universe existed for ten or fifteen billion years without any biological information present, so far as we know. The divine presence in that epoch will need to be found in the setup, in the fine-tuned universe, or, along the way, in, with, and under the physics, astrophysics, and chemistry. Such presence continues during the biological epoch on Earth. But now the creativity is more notably that generating the information vital to life. Again, one can appeal to the set-up. In our corner of the universe, the interplay of matter and energy accumulated into a solar system with one lucky planet. Perhaps there are other such planets; we do not know whether they are common or rare. But at least there is this one.

Located at a felicitous distance from the sun, Earth has liquid water; atmosphere; a suitable mix of elements, compounds, minerals; and an ample supply of energy. Radioactivity deep within the Earth

produces enough heat to keep its crust constantly mobile in counteraction with erosional forces, and the interplay of such forces generates and regenerates landscapes and seas – mountains, canyons, rivers, plains, islands, volcanoes, estuaries, continental shelves. Geochemistry is as relevant as chemistry. The properties of the elements – hydrogen, carbon, and so on – are necessary but not sufficient. The properties of the Earth system, a kind of cooking pot, are also necessary, and, together with the physicochemical properties, perhaps these are sufficient to make life probable, even inevitable.

Detecting the transcendent asks whether God underlies that setup. God lies in, with, and under the forces that created Earth as the home (the ecosystem) that could produce all those myriads of kinds. God, the Ground of the Universe, is also the Good Fortune of the Planet. "Let the earth bring forth living creatures according to their kinds" (Genesis 1.24). The Earth-system does prove to be prolife; the story goes from zero to five million species in five billion years, passing through perhaps five billion species that have come and gone en route. The setup, first on cosmological levels and later on planetary levels, mixes chance and order in creative ways. If, once, there was a primitive planetary environment in which the formation of living things had a high probability, for such living things to become actual would require not so much interference by a supernatural agency as the recognition of a marvelous endowment of matter with a propensity toward life. So the molecular biologists were earlier arguing. Such a natural performance could be congenially seen, at a deeper level, as the divine creativity.

But one still has to give an account of the information appearing *ex nihilo*, that is, where no such information was present before. One may indeed need a fortunate endowment of matter with a life propensity (helped perhaps by the anthropic principle in astrophysics) and at the same time still need something to superintend the possibilities during evolutionary history. That there are complementary explanations does not always mean that one is superfluous. Here one can posit God as a countercurrent to entropy, a sort of biogravity that lures life upward. God would not do anything in particular but be the background, autopoietic force energizing all the particulars. The particulars would be the discoveries of the autonomous individuals. God would be the lift-up (more than the setup) that elevates the creatures along their paths of cybernetic and storied achievement. God introduces new possibility spaces all along the way. What the-

ologists once termed an established order of creation is rather an order that dynamically creates, an order for creating.

One should posit, says Daniel Dennett, "cranes," not "skyhooks," for the building up of evolutionary history (1995, pp. 73-80). That contrast of metaphor seems initially persuasive, appealing to causes more natural than supernatural, more immanent than transcendent. When we pinpoint the issue, however – what account to give of this remarkable negentropic, cybernetic self-organizing that characterizes the life story on Earth – the metaphor becomes more pejoratively rhetorical than analytically penetrating. There is the repeated discovery of information how to redirect the downhill flow of energy upward for the construction of ever more advanced, higher forms of life, built on and supported by the lower forms. Up and down are rather local conditions (down, up a few miles); it does not matter much which direction we imagine this help as coming from – east or west, from the right or left, from below or above, high or deep, immanence or transcendence, skyhooks or cranes. The Hebrew metaphor was that one needs "wind" as well as "dirt." The current metaphor is that one needs "information" as well as "matter" and "energy."

Stripped of the rhetoric, what the "skyhook" metaphor means, Dennett says, is explanations that are more "mindlike," and the "cranes" metaphor posits "mindless, motiveless mechanicity." Dennett holds that Darwinian science, extrapolated philosophically, has discovered cranes upon cranes "all the way down" and building up and up with "creative genius." "There is simply no denying the breathtaking brilliance of the designs to be found in nature" (1995, pp. 76, 155, and 74). But if the secret of such creativity is information possibilities opening up and information searched and gained, then the kind of explanation needed can as plausibly be said to be mind-like as mindless mechanicity.

One might look to the potential deep in matter, "cranes all the way down." There is a kind of bottomless bootstrapping, as if lifting oneself up and up by one's own bootstraps were not remarkable, matter lofting itself up into mind. Such cranes, piling up higher and higher, are still pretty "super," quite imposing with their endless superimposing of one achievement on another. One can just as well look to some destiny toward which such matter is animated and inspired (skyhooks). Even after an infinite regress of cranes, or a regress ending in nothing at all, or in informationless matter-

energy, or in a big bang, one might not find that explanations are over. The issue is where the information comes from by which matter and energy become so superimposingly informed across evolutionary history that this brilliant, "sacred" (Dennett) output arises from a beginning in mindless chaos; how "out of next to nothing the world we know and love created itself" (p. 185).

In this "world of propensities," concludes Karl Popper, the "inherently creative" process with its "staggering" biodiversity is neither mechanistic nor deterministic. "This was a process in which both *accidents* and *preferences*, preferences of the organisms for certain possibilities, were mixed: the organisms were in search of a better world. Here the preferred possibilities were, indeed, allurements" (1990, pp. 26 and 20). Cranes or skyhooks, evolutionary development is "attracted to" (in the current "chaos" metaphor) cumulating achievements in both diversity and complexity, and this attraction needs explanation. Attractors, or, at a more metaphysical level, even an Attractor, seem quite rational explanations.⁶

Returning to the metaphor of the alphabet and Shakespeare, the question is whether, in the introduction of these possibilities, one needs an author as well as an alphabet. What is required to get *Hamlet* is a great deal of information input into the letters. Perhaps the alphabet-author analogy is flawed. That analogy places all the creativity in the author working with an inert alphabet. One needs rather to posit a self-organizing alphabet, and a maker to start up and sustain such a self-organizing alphabet. Still, the elemental materials are not evidently an alphabet from the beginning; they have to be taken over for alphabetic functions. Some story has to be generated with these materials-become-alphabet. That requires information input

"To me the most fascinating property of the process of evolution is its uncanny capacity to mirror *some* properties of the human mind (the intelligent Artificer) while being bereft of others" (Dennett 1987, p. 299). It seems important to Dennett that the design is a mirage. Or, more accurately, the design isn't a mirage, for there is a designing system, but that there is a Designer of the designing system is a mirage. One needs no supernature, and the evidence for this is that we can plunge into subnature, and subsubnature, and subsubsubnature, simplifying all the way down until there is nothing at all. Although creativity is forbidden from above, it is welcomed from below. But set aside the above-below imagery, still the "attraction" to something out of chaos, the "genesis" of something out of nothing, of more out of less – such brute fact remains as evident as ever, and as demanding of explanation.

into such alphabetic materials, or, if not "input," information generation in some way or other. The skeptic will protest that there is no need for an author at all. One can have law without lawgivers, history without historians, creativity without creators, information without an informer, and stories without storytellers.

Change the analogy: the elements are more like "seeds" than "letters." The root meaning of "nature" is "generating," and nature has all these possibilities "seeded" into it. The problem with such a model is that we now know what is in seeds as the secret of their possibilities – information – and there is no such information inside amino acids, much less hydrogen and carbon atoms, much less electrons and protons. The creation of matter, energy, law, history, stories, of all the information that generates nature, to say nothing of culture, does need an adequate explanation: some sources, source, or Source competent for such creativity. Seeds need a source. In the materializing of the quantum states, bubbling up from below; in the compositions of prebiotic molecules; in the genetic mutations, there are selective principles at work, as well as stabilities and regularities, forming and in-forming these materials, which principles order and order up the story.

This portrays a loose teleology, a soft concept of creation, one that permits genuine, though not ultimate, integrity and autonomy in the creatures. We have in the life adventure an interaction phenomenon, where a prolife principle is overseeing the affairs of matter. The divine spirit is the giver of life, pervasively present over the millennia. God is the atmosphere of possibilities, the metaphysical environment in, with, and under first the natural and later also the cultural environment, luring the Earthen histories upslope. God orchestrates such self-organizing, steadily elevating the possibilities, making for storied achievements, enriching the values generated.

God could sometimes also be in the details. The general picture is not one of divine micromanagement; rather of secular integrity and creaturely self-organizing. The extent to which divine inspiration enters into particulars might be difficult to know, especially if God operated with the resolve to maximize the creaturely autonomy, to prompt rather than to command. Dennett concedes, for example, that no Martian biologists, examining "a laying hen, a Pekingese dog, a barn swallow, and a cheetah," could prove, simply from an examination of the organisms, that the former were the product of deliberate, engineered artificial selection, as well as of natural selection,

and the latter were the product of natural selection only. "If the engineers chose to conceal their interventions as best they could. . . there may be no foolproof marks of natural (as opposed to artificial) selection" (1987, pp. 284r-285).

If there has been divine selection, this will not be detectable as any gap in or perforation of the natural order; it might be detectable in the resulting genesis, or creativity. If the roulette wheels at Las Vegas spin at random most of the time, but once a year God loaded the dice, that would be difficult to detect. Chance is an effective mask for the divine action. Still, God could be slipping information into the world. One might suspect such divine presence if the resulting story, in the lotteries of natural history, produced the epic adventures that have in fact actually managed to happen. An "information explosion" on our Earth, rare in the universe, might be a clue that "inspiration" is taking place.

Perhaps it is a mistake to look for God in the particulars of information discovery. God does not intervene as a causal force in the world, not at least of such kind as science can detect. "God" is not among the entries to be found in the index of a biology text. God perennially underlies the causal forces in the world, and God gives meaning to the world, which science is incompetent to evaluate. That does require the introduction of channels for information, and information in those channels, which arrives in the particulars of genetic trial and error. Such information is not a mere cause, not in any physicochemical sense, but a novel "cause" that puts meanings into events, that generates all the richness of evolutionary history.

God is an explanatory dimension⁷ for which contemporary biology leaves ample space, as we have seen as biologists stutter over the origins of the information that generates complexity and diversity, over any selection for progress, over what to make of randomness, over the introduction of possibilities. If one adds the desire of a Creator not so much to conceal such complementing selective activity as to optimize the integrity, autonomy, and self-creativity of the creatures – letting them do their thing, generating and testing, discarding what does not work and keeping what does – with divine coaching on occasion, then a conclusion that there is a divine presence underneath natural history becomes as plausible as that there is

⁷ A cause in the Aristotelian, though not the scientific sense.

not. The question becomes not so much a matter of conclusive proof as of warranted faith.

There once was a causal chain that led to vertebrae in animals, where there were none before, an incremental chain no doubt, but still a chain by which the novelty of the vertebral column was introduced on Earth. Such a chain is constructed with the emergence of more and more information; this information, coded in DNA, informs the matter and energy so as to build the vertebral cord. The cord is constructed because it has a value (a significance, here a precursor of meaning) to the organism. It makes possible the diverse species of life that the vertebrate animals defend. Continuing the development of the endoskeleton, it makes possible larger animals with mobility, flexibility, integrated neural control. When such construction of valuable biodiversity has gone on for millennia, the epic suggests mysterious powers that signal the divine presence.

The question, the biologists will say, is of the selective forces. Yes, but the answer comes, partly at least, from seeing the results, with ever more emerging from what is earlier less and less. One seeking to detect the divine inspiration will notice how there are occasions – seasons, contexts, events, episodes, whatever they are called – during which critical information emerges in the world, breakthroughs, as it were, incremental and cumulative though these can also be. This will be true in culture, perhaps the inspiration that underlies the Ten Commandments or the Sermon on the Mount. It can as well be true in nature, in some inspiration that first animates matter and energy into life; or launches replication and genetic coding, or eukaryotes, or multicellular life, or sexuality; or energizes life with mitochondria and chloroplasts, or glycolysis and the citric acid cycle; or moves life onto land; or invents animal societies or acquired learning; or endows life with mind; and inspires culture, ethics, religion, science.

The skeptic's reply is always to emphasize that evolution is not elegant. It is wasteful, blundering, struggling. Evolution works with what is at hand and makes something new out of it. The creatures stumble around, and if there is a God who "intervenes," God ought to do better than that. There is only a "blind watchmaker" (Dawkins 1986). Still, consider again the remarkable results, and the providence appropriate to a God who celebrates an Earth history, who inspires self-creativity. The word "design" nowhere occurs in Genesis,⁸

⁸ The word "design" also seldom occurs in this book, by design.

though the concept of creativity pervades the opening chapters. There is divine fiat, divine doing, but the mode is an empowering permission that places productive autonomy in the creation. It is not that there is no "watchmaker"; there is no "watch." Looking for one frames the problem the wrong way. There are species well adapted for problem solving, ever more informed in their self-actualizing. The watchmaker metaphor seems blind to the problem that here needs to be solved: that informationless matter-energy is a splendid information maker. Biologists cannot deny this creativity; indeed, better than anyone else biologists know that Earth has brought forth the natural kinds, prolifically, exuberantly over the millennia, and that enormous amounts of information are required to do this.

The achievements of evolution do not have to be optimal to be valuable, and if a reason that they are not optimal is that they had to be reached historically along story lines, then we rejoice in this richer creativity. History plus value as storied achievement in creatures with their own integrity is better than optimum value without history, autonomy, or adventure in superbly designed marionettes. That is beauty and elegance of a more sophisticated form, as in the fauna and flora of an ancient forest. The elegance of the thirty-two crystal classes is not to be confused with the grace of life renewed in the midst of its perpetual perishing, generating diversity and complexity, repeatedly struggling through to something higher, a response to the brooding winds of the Spirit moving over the face of these Earthen waters.