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CHAPTER 53

ENVIRONMENTAL ETHICS AND RELIGION/ SCIENCE

HOLMES ROLSTON III

What to make of who we are, where we are, what we ought to do? These perennial questions are familiar enough; what is recently extraordinary is how the science–religion dialogue reframes these old questions with an *on Earth* dimension. What to make of Earth, the home planet? Earth is proving to be a remarkable planet, and humans have deep roots in and entwined destinies with this wonderland Earth. Simultaneously, however, humans are remarkable on this remarkable planet, a wonder on wonderland Earth. But the foreboding challenge is that these spectacular humans, the sole moral agents on Earth, now jeopardize both themselves and their planet. Science and religion are equally needed, and strained, to bring salvation (to use a religious term), to keep life on Earth sustainable (to use a more secular, scientific term).

WHERE ON EARTH ARE WE?

Where are we located? Where are we on Earth? What's the 'set-up'? Environmentalists claim that an organism's surroundings, from the skin out, are as telling as organismic identity, from the skin in. They insist on knowing locations,

habitats, niches. This locating of ourselves has been escalating from ecosystems to bioregions and continents, and lately, increasingly requires a global view. At cosmological scales there is deep space and time; at evolutionary scales Earth is a marvellous planet, a wonderland lost in this deep spacetime. Alas too, at anthropocentric and economic scales, this Earth is in deep jeopardy.

Astronaut Edgar Mitchell, a rocket scientist, reports being earthstruck:

> Suddenly from behind the rim of the room, 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 thick sea of black mystery. It takes more than a moment to fully realise this is Earth-home. (Quoted in Kelley 1988: at photograph 42)

That indicates what many scientists think in their more philosophical moments: we are located on a sparkling planetary jewel. Almost everyone on Earth has been moved by those photographs from space. The mystery, however, is not only the surrounding black space in which we are located but how there comes to be this spectacular home planet. These are limit questions that reach toward religious answers: the meaning and significance of life on Earth.

Science has found some surprising things about that surrounding black space; this too is part of the set-up. Astrophysics and nuclear physics, combining quantum mechanics and relativity theory, have described a universe 'fine-tuned' for life, originating some 15 billion years ago in a 'big bang'. Startling interrelationships are required for these creative processes to work; these are gathered under the concept of the 'Anthropic Principle', which might better have been termed a 'biogenic principle' (Leslie 1990; Barrow and Tipler 1986; Barr 2003).

The native-range Earth world stands about midway between the infinitesimal and the immense on the natural scale. The mass of a human being is the geometric mean of the mass of Earth and the mass of a proton. A person contains about 10^{28} atoms, more atoms than there are stars in the universe. In astronomical nature and micro-nature, at both ends of the spectrum of size, nature lacks the complexity that it demonstrates at the meso-levels, found at our native ranges on Earth. On Earth, the surprises compound.

Earth is a kind of providing ground for life, a planet with promise. 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. Geological forces generate and regenerate landscapes and seas—mountains, canyons, rivers, plains, islands, volcanoes, estuaries, continental shelves. The Earth-system is a kind of cooking pot sufficient to make life possible. Spontaneously, natural history organizes itself.

The system proves to be pro-life; the story goes from zero to 5 million species (more or less) in 5 billion years, passing through 5 billion species (more or less) which have come and gone en route, impressively adding diversity and complexity to simpler forms of life. Prokaryotes dominated the living world more than 3 billion years ago; there later appeared eukaryotes, with their well-organized nucleus and

cytoplasmic organelles. Single-celled eukaryotes evolved into multi-celled plants and animals with highly specialized organ systems. First there were cold-blooded animals at the mercy of climate, later warm-blooded animals with more energetic metabolisms. From small brains emerge large central nervous systems. Instinct evolves into acquired learning. Parental care develops, animal societies, and at length humans with their capacities for language and culture. Palaeontology reports this in increasing detail, and taking the broad view, prima facie the most plausible account seems to find some programmatic evolution toward value.

Does the Earth set-up make life probable, even inevitable? Biologists spread themselves across a spectrum thinking that natural history is random, contingent, caused, unlikely, likely, determined, open. Many hold that we need to put some kind of an arrow on evolutionary time. Simon Conway Morris is recently the most vigorous palaeontologist arguing that human life has appeared only on Earth but did so here as a law of the universe: We are 'inevitable humans in a lonely universe'. 'The science of evolution does not belittle us.... Something like ourselves is an evolutionary inevitability' (Conway Morris 2003: p. xv). Christian de Duve, Nobel laureate, argues that 'Life was bound to arise under the prevailing conditions.... I view this universe [as]... made in such a way as to generate life and mind, bound to give birth to thinking beings' (de Duve 1995: pp. xv, xviii).

On opposing accounts, the history of life is a random walk with much struggle and chance (famously in Monod 1972; repeatedly in Gould 1989). Evolutionary history can seem tinkering and make-shift. Natural selection is thought to be blind, both in the genetic variations bubbling up without regard to the needs of the organism, some few of which by chance are beneficial, and also in the evolutionary selective forces, which select for survival, without regard to advance. Many evolutionary theorists doubt that the Darwinian theory predicts the long-term historical innovations that have in fact occurred (Maynard Smith and Szathmáry 1995: 3).

Whether evolutionary theory explains this or not, those who want a comprehensive view insist that it would be a quite anomalous result if there had appeared novel kinds steadily over many millennia but only by drifting into them. The natural history suggests a creative genesis of life. Earth history is the story of how significant values are generated and endure through a context of suffering, stress, perpetual perishing, and regeneration. At this point we reach the equally debated 'value' question. Are we humans located on this Earth in value isolation from the nature out of which we have come? Or is our location, with our evidently unique capacities for valuing, part of a more comprehensive community of value?

Western science accompanied the Enlightenment; and, with its legacies in Cartesian mind–body dualism, the prevailing account found that nature is value-free. That seemed plausible looking at Sun, Moon, and stars, or rock strata, or atoms—in the physical sciences. Biologists, confronted by life in its relentless vitality, were never so easily persuaded of this. But life did increasingly seem to be a matter of biochemistry. Value, on the Enlightenment account, appeared only in psychology, with the experience of felt interests, and this flowered in human life. With the coming of ecological science, prodding by a revisiting of the issue in evolutionary science, and with the

coming of cybernetic interpretations of genetics, the value issue has been thrown into new light. We were not so 'enlightened' as we supposed.

'Value' is a frequently encountered term in evolutionary biology and in ecosystem science—and this despite the 'value-free' science—Enlightenment humanism. 'An ability to ascribe value to events in the world, a product of evolutionary selective processes, is evident across phylogeny. Value in this sense refers to an organism's facility to sense whether events in its environment are more or less desirable' (Dolan 2002: 1191). Adaptive value, survival value, is the basic matrix of Darwinian theory. An organism is the loci of values defended; life is otherwise unthinkable. Such organismic values are individually defended; but, ecologists insist, organisms occupy niches and are networked into biotic communities. At this point ethicists, looking over the shoulders of biologists describing this display of biodiversity, millions of species defending their kind over millennia, begin to wonder whether there may be goods (values) in nature which humans ought to consider. Animals, plants, and species, integrated into ecosystems, may embody values that, though non-moral, count morally when moral agents encounter these.

Here Judaeo-Christian monotheists will invoke the Genesis accounts of a good creation—and may begin to wonder how so-called enlightened biology ever got into the mode of a value-free nature. They cheer rather for the 'conservation biologists', delighted that within academic biology the growth of groups such as the Society for Conservation Biology has been spectacular, and that conservation biology is regularly featured in such publications as *Science* and *BioScience*. Biblical writers already had an intense sense of the worth (value) of creation. Nature is a wonderland. 'Praise the Lord from the earth, you sea monsters and all deeps, fire and hail, snow and frost, stormy wind fulfilling his command! Mountains and all hills, fruit trees and all cedars! Beasts and all cattle, creeping things and flying birds!' (Psalm 148: 7–10; RSV). 'The hills gird themselves with joy, the meadows clothe themselves with flocks, the valleys deck themselves with grain, they shout and sing for joy' (Psalm 65: 12–13).

Encountering the vitality in their landscapes, the Hebrews formed a vision of creation, cast in a Genesis parable: the brooding Spirit of God animates the Earth, and Earth gives birth. 'The earth was without form and void, and darkness was upon the face of the deep; and the Spirit of God was moving over the face of the waters. And God said, "Let there be..."' (Genesis 1: 2–3). 'Let the earth bring forth living things according to their kinds' (Genesis 1: 11, 24). 'Let the waters bring forth swarms of living creatures' (Genesis 1: 20). Earth speciates. God, say the Hebrews, reviews this display of life, finds it 'very good', and bids it continue. 'Be fruitful and multiply and fill the waters in the seas, and let birds multiply on the earth' (Genesis 1: 22). In current scientific vocabulary, there is dispersal, conservation by survival over generations, and niche saturation up to carrying capacity.

Anciently, the Hebrews marvelled over the 'swarms' (= biodiversity) of creatures Earth brings forth in Genesis 1. These were brought before man to name them (a taxonomy project!). Classically, theologians spoke of 'plenitude of being'. Contemporary biologists concur that Earth speciates with marvellous fecundity; the systematists have named and catalogued a far vaster genesis of life than any available to

ancient or medieval minds. Contemporary biologists, almost without exception, urge the conservation of this richness of biodiversity. Learn it from a conservation biology textbook, or learn it from the Bible, science and religion have a common and urgent agenda.

Value in nature is recognized again when the fauna are included within the Hebrew covenant. 'Behold I establish my covenant with you and your descendants after you, and with every living creature that is with you, the birds, the cattle, and every beast of the earth with you' (Genesis 9: 5). In modern terms, the covenant was both ecumenical and ecological. It was 'theocentric', theologians might insist; but if so, it was also less 'anthropocentric' and more 'biocentric' than traditional Jews or Christians realized. Noah with his ark was the first Endangered Species Project. The science is rather archaic, but the environmental policy ('Keep them alive with you' (Genesis 6: 19)) is something the US Congress reached only with the Endangered Species Act in 1973.

Biologists find biological creativity indisputable, whether or not there is a Creator. Biologists have no wish to talk theologians out of genesis. Whatever one makes of God, biological creativity is indisputable. There is creation, whether or not there is a Creator, just as there is law, whether or not there is a Lawgiver. Biologists are not inclined, nor should they be as biologists, to look for explanations in supernature, but biologists nevertheless find a nature that is super! Superb! Biologists may be taught to eliminate from nature any suggestions of teleology, but no biologist can doubt genesis.

Somewhat ironically, just when humans, with their increasing industry and technology, seemed further and further from nature, having more knowledge about natural processes and more power to manage them, just when humans were more and more rebuilding their environments, thinking perhaps to escape nature, the natural world has emerged as a focus of concern. Nature remains the milieu of culture—so both science and religion have discovered. In a currently popular vocabulary, humans need to get themselves 'naturalized'. Using another metaphor, nature is the 'womb' of culture, but a womb that humans never entirely leave. Almost like God—to adopt classical theological language—nature is 'in, with, and under us'.

Who on Earth Are We?

We next encounter the question of the human place on Earth. Humans are part of, yet apart from, nature; we evolved out of nature, yet we did evolve *out of* it. Yes, transcend wild spontaneous nature though we may, we still require an earthen life support system; but humans are something special on Earth. With us the black mystery compounds again. Humans are a quite late and minor part of the world in evolutionary and ecological senses. They are one more primate among hundreds, one more vertebrate among tens of thousands, one more species among many millions.

But there is also a way in which this 'last' comes to be 'first'. Humans can seem minuscule at astronomical levels; they can seem ephemeral on evolutionary scales. Humans do not live at the range of the infinitely small, or at that of the infinitely large, but humans on Earth do seem, at ecological ranges, to live at the range of the infinitely complex, evidenced both in the biodiversity made possible by genetics and in the cultural history made possible by the human mind. If we ask where are the 'deep' thoughts about this 'deep' nature, they are right here. *Homo sapiens* is the first and only part of the world free to orient itself with a view of the whole, to seek wisdom about who we are, where we are, where we are going, what we ought to do.

We humans are the most sophisticated of known natural products. In our 150 pounds of protoplasm, in our 3-pound brain is more operational organization than in the whole of the Andromeda galaxy. On a cosmic scale, humans are minuscule atoms. Yet the brain is so curiously a microcosm of this macrocosm. Not only evolutionary biologists, but also astrophysicists, are studying their own origins (since our elements were made in the stars). They are an end of what they are watching the beginnings of, one of the consequences of the stellar chemistry, which now can reflect over this world. We humans too are 'stars' in the show. In that sense, the most significant thing in the known universe is still immediately behind the eyes of the astronomer!

Animal brains are already impressive. In a cubic millimetre (about a pinhead) of mouse cortex there are 450 metres of dendrites and 1–2 kilometres of axons; each neuron can synapse on thousands of others. But this cognitive development has reached a striking expression point in the hominid lines leading to *Homo sapiens*, going from about 300 to 1,400 cubic centimetres of cranial capacity in a few million years. The human brain has a cortex 3,000 times larger than that of the mouse. Our protein molecules are 97 per cent identical to those in chimpanzees, only 3 per cent different. But we have three times their cranial cortex. The connecting fibres in a human brain, extended, would wrap around the Earth forty times.

The human brain is of such complexity that descriptive numbers are astronomical and difficult to fathom. A typical estimate is 10^{13} neurons, each with several thousand synapses (possibly tens of thousands). Each neuron can 'talk' to many others. This network, formed and re-formed, makes possible virtually endless mental activity. The result of such combinatorial explosion is that the human brain is capable of forming more possible thoughts than there are atoms in the universe.

Some trans-genetic threshold seems to have been crossed. Humans have made an exodus from determination by genetics and natural selection and passed into a mental and social realm with new freedoms. Richard Lewontin, Harvard biologist, puts it this way:

> Our DNA is a powerful influence on our anatomies and physiologies. In particular, it makes possible the complex brain that characterizes human beings. But having made that brain possible, the genes have made possible human nature, a social nature whose limitations and possible shapes we do not know except insofar as we know what human consciousness has already made possible.... History far transcends any narrow limitations that are claimed for either the power of the genes or the power of the environment to circumscribe us.... The

genes, in making possible the development of human consciousness, have surrendered their power both to determine the individual and its environment. They have been replaced by an entirely new level of causation, that of social interaction with its own laws and its own nature. (Lewontin 1991: 123)

The genes outdo themselves. Mind of the human kind seems to require incredible opening up of new possibility space.

J. Craig Venter and more than 200 co-authors, reporting on the completion of the Celera Genomics version of the Human Genome Project, caution in their concluding paragraph:

In organisms with complex nervous systems, neither gene number, neuron number, nor number of cell types correlates in any meaningful manner with even simplistic measures of structural or behavioural complexity.... Between humans and chimpanzees, the gene number, gene structural function, chromosomal and genomic organization, and cell types and neuroanatomies are almost indistinguishable, yet the development modifications that predisposed human lineages to cortical expansion and development of the larynx, giving rise to language culminated in a massive singularity that by even the simplest of criteria made humans more complex in a behavioural sense.... The real challenge of human biology, beyond the task of finding out how genes orchestrate the construction and maintenance of the miraculous mechanism of our bodies, will lie ahead as we seek to explain how our minds have come to organize thoughts sufficiently well to investigate our own existence. (Venter *et al.* 2001: 1347–8)

The surprise is that human intelligence becomes reflectively self-conscious and builds cumulative transmissible cultures. An information explosion gets pinpointed in humans. Humans alone have 'a theory of mind'; they know that there are ideas in other minds, making linguistic cultures possible. Our ideas and our practices configure and re-configure our own sponsoring brain structures. In the vocabulary of neuroscience, we have 'mutable maps'. For example, with the decision to play a violin well, and resolute practice, string musicians alter the structural configuration of their brains to facilitate fingering the strings with one arm and drawing the bow with the other (Elbert *et al.*, 1995). With the decision to become a taxi driver in London, and long experience driving about the city, drivers likewise alter their brain structures, devoting more space to navigation-related skills than non-taxi drivers have (Maguire *et al.* 2000: 4398). Similarly with other decisions to learn. The human brain is as open as it is wired up. Our minds shape our brains.

In the most organized structure in the universe, molecules, trillions of them, spin round in and generate the unified, centrally focused experience of mind. These events have 'insides' to them, subjective experience. There is 'somebody there', already in the higher animals, but this becomes especially 'spirited' in human persons. The peculiar genius of humans is that, superposed on biology, we become, so to speak, 'free spirits', not free from the worlds of either nature or culture, but free *in* those environments.

That humans are embodied spirits, capable of thinking about themselves and what they can and ought to do, is really beyond dispute. The act of disputing it, verifies it. The self-actualizing characteristic of all living organisms doubles back on itself in this

reflexive animal with the qualitative emergence of what the Germans call *Geist*, what existentialists call *Existenz*, what philosophers and theologians often call 'Spirit'. An object, the brained body, becomes a spirited subject.

There is a 'massive singularity' in humans (Venter *et al.* 2001). This cybernetic, cognitive emergence does not 'reduce' well; rather it tends to 'expand'. The past is not a good guide to what the future holds when there is this massive singularity. That brings, again, paradox and dialectic. Are we part of nature, or apart from nature? Yes and no. Nature hardly seems up to the guidance of the child she has delivered.

For some, that is cause for freedom and relief. Humans are self-defining animals. They do not need to consult nature, but are intellectually and morally free to do their own thing. But it also seems fitting that humans be defined in their place. Otherwise, we cancel all promise of showing a systematic unity between human life and cosmic or earthen nature. It is one thing to be set free in the world, another to be set adrift in it. So that—if you like—has now become the main agenda: the place of this spirit waked up in nature. What does human uniqueness imply for human responsibility? Once again, science and religion are equally challenged, and stressed, to answer.

What on Earth Are We Doing?

That brings us to ask what we are now doing? We start with three graphs as icons of the contemporary scene, indicating population, consumption, and distribution.

People are a good thing, people with energy at their service are fortunate, people need goods and services for an abundant life. On this both scientists and theologians agree; scientists have celebrated how applied science has given us better things for better living; Christians and other believers have shown great social concern for taking care of people, their physical as well as their spiritual needs. But when we join the first two graphs with the third, troubles loom. What we have been doing is rapidly escalating the human population, rapidly escalating energy consumption, typical of consumerism generally, and the distribution is quite disproportionate.

Human numbers are escalating around the world, much more so in lesser developed nations than in developed ones. About 20 per cent of the world's population in the developed nations (the Group of 7 (now 8), the big nations of North America, Europe, and Japan, 'the North') produces and consumes about 80 per cent of the world's goods and services. Conversely, 80 per cent of the people in the world produce and consume about 20 per cent of these goods and services (the G77 nations, once 77 but now including some 128 lesser developed nations, often south of the industrial north). Capitalism has become the dominant global economic system; coupled with science and technology it makes possible a growth in consumerism. But on its present course it is making the rich richer proportionately to any trickle-down benefits to the poor, evidenced in the 20–80 differential. For every dollar of economic

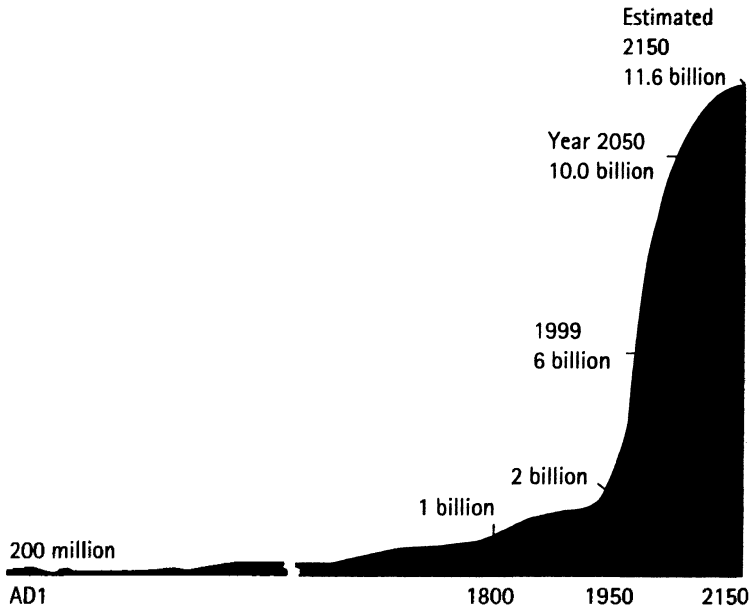

Fig. 53.1. World population growth data from (2000) *Statistical Abstract of the United States*, 120th edn. (2000).

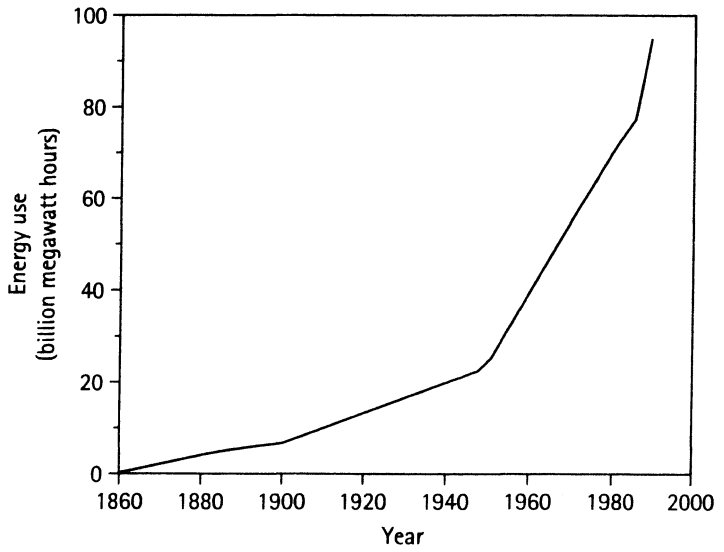

Fig. 53.2. Energy consumption: inanimate energy use from all sources. Data from Cohen (1995) and World Resources Institute (1994).

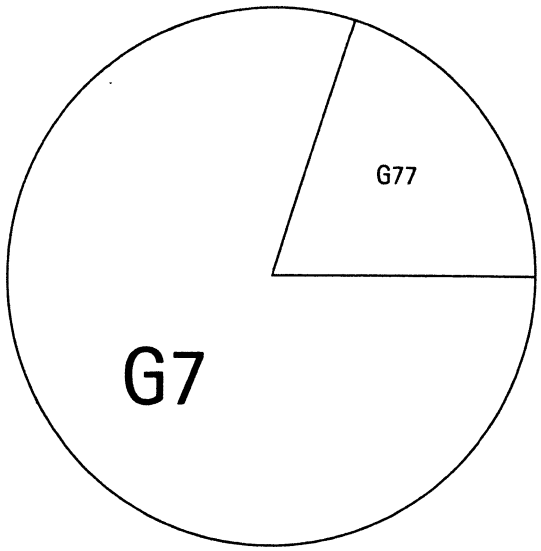

Fig. 53.3. G7 versus G77 nations. The pie chart summarizes population and production data in World Bank (2001). The G7 group has now become the G8 (United States, United Kingdom, France, Germany, Canada, Russia, Japan, and Italy).

growth per person in the South, twenty dollars accrue in the North. Free trade moves capital and goods across national boundaries in international markets, but the labour also required for production is confined within nations, which means that capital can relocate production seeking the cheapest labour.

The shadow side of this is a degrading environment in both developed and developing nations. Since the coming of science with its technology, since the invention of motors and gears in the mid-nineteenth century, giving humans orders of magnitude more power to transform the landscape, since the coming of modern medicine, there have been unprecedented changes in world population, in agricultural production, in industrial production, in transportation and communication, in economic systems, in military commitments—all these literally altering the face of the planet.

Humans now control 40 per cent of the planet's land-based primary net productivity: that is, the basic plant growth which captures the energy on which everything else depends (Vitousek *et al.* 1986). If the human population doubles, the capture will rise to 60–80 per cent. In another survey, researchers found the proportions of Earth's terrestrial surface altered as follows: (1) little disturbed by humans, 51.9 per cent; (2) partially disturbed, 24.2 per cent; (3) human-dominated, 23.9 per cent. Factoring out ice, rock, and barren land, which support little human or other life, the percentages become (1) little disturbed, 27.0 per cent; (2) partially disturbed, 36.7 per cent; (3) human-dominated, 36.3 per cent (Hannah *et al.* 1994). Most terrestrial nature is dominated or partially disturbed (73.0 per cent). There is the sea; Earth might as well have been called Aqua, since oceans cover 70 per cent

of the planet. But the sea too is increasingly affected. Over 90 per cent of the world's fisheries have been depleted; coastal development and pollution have caused sharp declines in ocean health. Increasingly less habitat remains for forms of life that cannot be accommodated in the nooks and crannies of a human-dominated world. This is producing an escalating extinction rate, comparable to that of the great catastrophic extinctions of the palaeontological past—with the difference that after natural extinctions there is re-speciation, whereas human extinctions shut down the speciating processes.

Humans do not use the lands they have domesticated effectively. A World Bank study found that 35 per cent of the Earth's land has now become degraded (Goodland 1992). In developed nations there has been much progress cleaning up air and water, but still, in the United States almost half the population lives in areas that do not meet national air-quality standards. Global warming threatens to disrupt not only fragile semi-arid areas but equally long-established agricultural patterns.

A central problem is that many environmental problems result from the incremental aggregation of actions that are individually beneficial. Coupled with a long lag time for environmental problems to become manifest, this masks the problem in both nature and human nature. A person may be doing what, taken individually, would be a perfectly good thing, a thing he or she has a right to do were he alone, but which, taken in collection with thousands of others doing the same thing, becomes a harmful thing. A good thing escalates into a bad thing. This is Garrett Hardin's tragedy of the commons (Hardin 1968). Pursuit of individual advantage destroys the commons.

Biologists may continue here with a more troubling concern. Theologians have classically found in humans a tendency to self-interest, to selfishness, to sin, and now the biologists concur. Indeed, the biologists may claim that humans are innately 'selfish' by Darwinian natural selection. The nature inherited in human nature is self-interested, and this, in an environmental crisis, may prove self-defeating. Theologians and biologists alike find too much in human nature that is irrational, blind. Although the conservation biologists celebrate Earth's biodiversity, the sociobiologists (and, later, evolutionary psychologists) worry that the human disposition to survive, a legacy of our evolutionary heritage, has left humans too locally short-sighted to deal with the environmental crisis at the global level.

Humans are not genetically or psychologically equipped to deal with collective issues that upset individual goals (Ehrlich and Ehrlich 2004). Biologists hold that we are naturally selected to look out for ourselves and our families, perhaps also to co-operate in tribes or for reciprocal benefits. Beyond that, humans are not biologically capable of more comprehensive vision, of considering the interests of others in foreign nations or in future generations, if this is at expense to our own interests (Sober and Wilson 1998; D. S. Wilson 2002). Humans are not rational in any 'absolute' or even 'global' sense; they bend their reason to serve their interests, competitively against others—other nations, tribes, or neighbours—when push

comes to shove. Hence the escalating violence and terrorism in today's world, the perpetrators often as not claiming their cause in the name of some faith. Humans inherit Pleistocene urges, such as an insatiable taste for sugar, salt, and fats, traits once adaptive, but which today make obesity a leading health problem. Our global environmental problems result from such insatiable consumptive Pleistocene urges. Too often the religions remain tribal; God is for me, for my kind, my nation; love your neighbour and hate your enemies. Can enlightened science or enlightened religion get us past this legacy? Were we not just celebrating the genius of the human mind, transcending genetics, making exoduses out of previous determinisms, opening up promising new possibility spaces? Even 'Enlightenment science' and 'Enlightenment religion', with all their focus on the (Western) human powers and achievements, may now need transcending, leaving behind a debilitating anthropocentric humanism, embracing a more inclusive vision of the goodness of the whole community of life on Earth.

Science and religion are equally challenged by this environmental crisis, each to re-evaluate the natural world, and each to re-evaluate its dialogue with the other. Both are thrown into researching fundamental theory and practice in the face of an upheaval unprecedented in human history, indeed in planetary history. Life on Earth is in jeopardy owing to the behaviour of one species, the only species that is either scientific or religious, the only species claiming privilege as the 'wise species', *Homo sapiens*. Facing the next century, Earth, the planet of promise, is a planet in peril. Science and religion will both be required for our salvation. We will need to mix science and conscience.

What on Earth Ought We to Do?

Science and Conscience

Scientists and ethicists alike have traditionally divided their disciplines into the realm of the *is* and the realm of the *ought*, continuing the Cartesian tradition, later further elaborated by David Hume and G. E. Moore. By this division, no study of nature can tell humans what ought to happen, on pain of committing the naturalistic fallacy. Ecologists who claim to know what we ought to do, sociobiologists who claim that humans can only be selfish or tribal, or theologians who claim to base ethics on ecology may be violating the long-established taboo against mixing facts and values. Recently, this neat division has been challenged by ecologists and conservation biologists and their philosophical interpreters.

Still, there is ambiguity: ecology reframes ways that we think about nature, but leaves deeper questions unanswered. Biologists may describe the nature out of which we have evolved; they may move us to regard such nature with care and concern; they

may caution us about legacies in our human nature. But have we, with our complex minds generating culture, not emerged into new ethical possibilities? What seem always to remain after science are the deeper value questions. After four centuries of Enlightenment and Western science, and with due admiration for impressive successes, the value questions in today's world are as urgent, sharp, and painful as ever. There is no scientific guidance of life.

Science could be part of the problem, not part of the solution. Science can, and often does, serve noble interests. But science can, and often does, become self-serving, a means of perpetuating injustice, of violating human rights, of making war, of degrading the environment. Science is used for Western dominion over nature. Science is equally used for Western domination of other nations. The values surrounding the pursuit of science, as well as those that govern the uses to which science is put, are not generated out of the science, not even ecological science, much less the rest of science.

Where science seeks to control, dominate, manipulate either persons or nature, or both, it blinds quite as much as it guides. Nothing in science ensures against philosophical confusions, against rationalizing, against mistaking evil for good, against loving the wrong gods. The whole scientific enterprise of the last four centuries could yet prove demonic, a Faustian bargain; and as good an indication as any of that is our ecological crisis (Rasmussen 1996).

Ecology as a science has to join with human ecology, where the religious dimension is more evident. Perhaps we ought not to focus on the ecological *science* that biblical writers might have known, but rather on the *human* ecology into which they had insight. Emphasize the *human*, not the *ecology*, side of the relationship. We need to regain their insights into human nature more than into nature. True, one cannot know the right way for humans to behave if one is ignorant of how human behaviours result in this or that causal outcome in the natural systems about which one is concerned—for example, whether letting the land lie fallow one year in seven is adequate to restore its productivity. But if humans by nature are prone to exploit, the rich gaining power over the poor, then does society need, after seven times seven years, to declare a sabbatical, resetting landholding patterns more equitably? Or to find other ways to ensure fair access to resources?

Religions are about that gap between *is* and *ought*, and how to close that gap. This often requires revealing how human nature functions and dysfunctions, and how to re-form, or redeem, this 'fallen' nature. Whatever biology discovers about our nature, in religion God is redeeming humans. Humans must repair their broken wills, discipline innate self-interest, and curb corrupt social forces. What it means to be blessed, what it means to be wicked: these are theological questions. One is not going to get much help here from ecology or from elsewhere in biology, any more than from astrophysics or soil chemistry.

However much ecology reframes nature for our re-evaluation, the deeper evaluative questions are still left open. In that sense, science cannot teach us what we most need to know about nature: that is, how to value it. Ecologists may be able to tell us

what our options are, what will work and what will not, what is the minimum baseline health of landscapes. But ecologists have no special competence in evaluating what rebuilding of nature a culture desires, and how far the integrity of wild nature should be sacrificed to achieve this. A people on a landscape will have to make value judgements about how much original nature they have, or want, or wish to restore, and how much culturally modified nature they want, and whether it should be culturally modified with more or less natural patterns remaining. Ought we to give priority to 'sustainable development', as the World Commission on Environment and Development (1987) recommends? Or to a 'sustainable biosphere', as the Ecological Society of America (Risser *et al.* 1991) recommends? There is nothing in ecology *per se* that gives ecologists any authority or skills to make these further decisions. Although ecological science cum conservation biology seems to couple the concerns of biology and religion congenially, we still have to be cautious and worry about that naturalistic fallacy.

This mix of science and conscience requires caring for people and caring for nature, and a fundamental tension in environmental ethics is whether and how far our ethics is human-centred, anthropocentric, and how far it is biocentric, respecting the comprehensive community of life on Earth. Maybe, to put it provocatively, religion cum science will move us to care for people, the science cum religion will move us to care for nature. Religion is for and about people caring for people; in environmental concerns such caring needs to be well-informed scientifically. Science, at least natural science, is about nature, describing how nature works; science has been doing this in ways that reveal a wonderland Earth. That prompts us to wonder whether caring for such nature is a religious concern. But this, again, proves a half-truth, mistaken if taken for the whole.

Caring for People

How *nature* works is the province of the physical and biological sciences. How *human nature* works is the province of religion, perhaps also of human sciences such as psychology and sociology. How human nature ought to work, how it can be reformed to work as it ought, is the province of ethics and religion. If we emphasize the *human*, not the *ecology*, side of the relationship, we recognize that religion has a vital role to play. We need human ecology, humane ecology. Religious ethicists can with considerable plausibility make the claim that neither technological development, nor conservation, nor a sustainable biosphere, nor sustainable development, nor any other harmony between humans and nature can be gained until persons learn to use the Earth both justly and charitably. Those twin concepts are not found either in wild nature or in any science that studies nature. They must be grounded in some ethical authority, and this has classically been religious.

The Hebrews were given a blessing with a mandate. The land flows with milk and honey (assuming good land husbandry) if and only if there is obedience to Torah. Abraham said to Lot, 'Let there be no strife between me and you, and between your

herdsmen and my herdsmen' (Genesis 13: 8), and they partitioned the common good equitably among themselves. The righteous life depicted in the Hebrew Bible is about a long life on Earth, sustainable until the third and fourth generations. Whatever it has to say about heaven, or life after death, the Bible is also about keeping this earthly life divine, godly, or at least human, humane, or 'righteous' and 'loving'.

Any people who cope on a landscape for centuries will have some store of ecological wisdom, but that is not what we really turn to classical religious faiths to learn. We turn to religions to deal with the disvalues in humans—their irrationality, their greed, their short-sightedness, in short, their sinfulness. Religions save, they regenerate; they hold forth an *ought* to guide what *is*. Humans sin, unlike the fauna and flora. Religion is for people, and not for nature; nor does salvation come naturally—even the earthly good life is elusive.

Ultimately such salvation is beyond the natural; perhaps it is supernatural by the grace of the monotheist God, perhaps in some realization of depths underlying the natural, such as Brahman or *sunyata*. Meanwhile, whatever the noumenal ultimate, humans reside in a phenomenal world, which they must evaluate, and in which they must live, hopefully redeemed or enlightened by their faiths.

Much concern has come to be focused on environmental justice; the way people treat each other is related to the way they treat nature. If humans have a tendency by nature to exploit, they will as soon exploit other people as nature (revealed by the 80 per cent–20 per cent chart and the environmental degradation sketched above). These are the underlying theological and ethical issues underlying global capitalism, consumerism, and nationalism. The combination of escalating populations, escalating consumption, global capitalism, struggles for power between and within nations, militarism, results in environmental degradation that seriously threatens the welfare of the poor today and will increasingly threaten the rich in the future. The four critical items on our human agenda are population, development, peace, and the environment. All are global; all are local; all are intertwined; in none have we modern humans anywhere yet achieved a sustainable relationship with our Earth. Our human capacities to alter and reshape our planet are already more profound than our capacities to recognize the consequences of our activity and deal with it collectively and internationally.

Caring for Nature

What we want is not just 'riches', but a 'rich life', and appropriate respect for the biodiversity on Earth enriches human life. Humans belong on the planet; they will increasingly dominate the planet. But we humans, dominant though we are, want to be a part of something bigger. Environmental justice needs to be eco-justice, as with the World Council of Churches' emphasis on 'justice, peace, and the integrity of creation'. Contemporary ethics has been concerned to be inclusive. Environmental ethics is even more inclusive. It is not simply what a society does to its poor, its blacks, slaves, children, minorities, women, handicapped, or future generations that

reveals the character of that society, but also what it does to its fauna, flora, species, ecosystems, and landscapes. Whales slaughtered, wolves extirpated, whooping cranes and their habitats disrupted, ancient forests cut, Earth threatened by global warming—these are ethical questions intrinsically, owing to values destroyed in nature, as well as also instrumentally, owing to human resources jeopardized. Humans need to include nature in their ethics; humans need to include themselves in nature.

Ecologists may insist at this point that environmental science sometimes does inform an environmental evaluation in subtle ways. Consider some of the descriptive categories used of ecosystems: the *order*, *stability*, *complexity*, and *diversity* in these biotic *communities*. Ecologists describe their *interdependence*, or speak of their *health* or *integrity*, perhaps of their *resilience* or *efficiency*. Biologists describe the *adapted fit* that organisms have in their niches, the roles they play. Biologists may describe an ecosystem as *flourishing*, as *self-organizing*, perhaps as *dynamically developing*, or *regenerating*. Strictly interpreted, these are just descriptive terms; yet often they are already quasi-evaluative terms.

Other ecologists challenge such a positive account of ecosystems (Pickett *et al.* 1992). Disturbance interrupts the orderly succession of ecosystems, producing patchwork and even chaotic landscapes. Over decades and centuries, ecosystems change. Over millennia, one ecosystem evolves into another. Always, though, evolution and ecology both require organisms selected to be good, adapted fits, each in the niche it inhabits. Misfits go extinct, and easily disrupted ecosystems collapse and are replaced by more stable ones. There are ordered regularities (seasons returning, the hydrologic cycle, acorns making oak-trees, squirrels feeding on the acorns) mixed with episodic irregularities (droughts, fires, lightning killing an oak, mutations in the acorns).

The rains come; leaves photosynthesize; insects and birds go their way; earthworms work the soil; bacteria break down wastes that are recycled; coyotes have their pups and hunt rabbits; and on and on. Natural systems (such as the Serengeti plains of Africa) were often sustained in the past for long periods, even while they were gradually modified. R. V. O'Neill *et al.* conclude that those who see stability and those who see change are looking at two sides of one coin: 'In fact, both impressions are correct, depending on the purpose and time-space scale of our observations' (O'Neill *et al.* 1986: 3). 'The dynamic nature of ecosystems', concludes Claudia Pahl-Wostl, is 'chaos and order entwined' (Pahl-Wostl 1995).

But this dynamic openness is also welcome. Ecosystems are equilibrating systems composed of co-evolving organisms, with checks and balances pulsing over time. Many general characteristics are repeated; many local details vary. Patterns of growth and development are orderly and predictable enough to make ecological science possible—and also to make possible an environmental ethics respecting these creative, vital processes. Natural selection means changes, but natural selection fails without order, without enough stability in ecosystems to make the mutations selected for dependably good for the time being. A rabbit with a lucky genetic mutation that enables it to run a little faster has no survival advantage to be selected for unless there are coyotes reliably present to remove the slower rabbits.

Ecosystems have to be more or less integrated (in their food pyramids, for example), relatively stable (with more or less dependable food supplies, grass growing again each spring for the rabbits), and with persistent patterns (the hydrologic cycle watering the grass), or nothing can be an adapted fit, nor can adaptations evolve. Ecosystems get tested over thousands of years for their resilience. This is true even though ecosystems are continually changing and though from time to time natural systems are upset (when volcanoes erupt, tsunamis destroy whole regions, or catastrophic epidemics break out). Then organisms have to adapt to altered circumstances, and, as new interdependencies and networks appear, the integrity of ecosystems has to become re-established.

Evolutionary biologists add that their science has made quite commanding discoveries about the comprehensive history of life on Earth: that is, about what these dynamic changes and upsets in ecosystems have produced. There is something awesome about an Earth that begins with zero and runs up toward 5–10 million species in several billion years, setbacks and upsets notwithstanding. The long evolutionary history fact of the matter seems valuable; it commands respect, as biologists recognize, even reverence, as theologians claim. When one celebrates the biodiversity and wonders whether there is a systemic tendency to produce it, biology and theology become natural allies. Perhaps this alliance can help humans to correct the misuses to which science has been put—with more respect and reverence for life.

Though biologists (in their philosophical moments) are typically uncertain as to whether life has arrived on Earth by divine intention, they are almost unanimous in their respect for life and seek biological conservation on an endangered planet. Earth's impressive and unique biodiversity, evolved and created in the context of these ecosystems, warrants wonder and care. There is but one species aware of this panorama of life, a species at the same time jeopardizing this garden Earth.

Asking about respect for creation, critics of Western monotheism may reply that the problem is the other way round. Judaeo-Christian religion has not adequately cared for nature because it saw nature as the object of human dominion. Famously, historian Lynn White, though himself a Christian, laid much of the blame for the ecological crisis on Christianity, an attack published in *Science*, the leading journal of the American Association for the Advancement of Science (White 1967). God's command in Genesis 1 for humans to 'have dominion' flowered in medieval Europe, licensed the exploitation of nature, and produced science and technology that have resulted in an ecological crisis. Ecofeminists, post-modernists, and proponents of Asian faiths have joined in such criticism. Equally of course White was attacking science for buying into a secular form of the dominion hypothesis, but the original authorization, so he claimed, was religious. After the Fall, and the disruption of garden Earth, nature too is corrupted, and life is even more of a struggle than before. Nature needs to be redeemed by human labour.

Theologians have replied that appropriate dominion requires stewardship and care (Birch, Eakin, and McDaniel 1990; Cobb 1972; DeWitt 1998; Nash 1991). Adam and Eve are also commanded to 'till the garden and keep it' (Genesis 2: 15), a more positive sense of dominion. Adapting biblical metaphors for an environmental

ethic, humans on Earth are, and ought to be, prophets, priests, and kings—roles unavailable to non-humans. Humans should speak for God in natural history, should reverence the sacred on Earth, and should rule creation in freedom and in love.

The same Genesis stories teach the human fall into sin driven by desire to be like God, in tension with being made in the image of God. Humans covet, worship false gods; they corrupt their faiths, they rationalize in self-deception. Faiths must be ever reforming; humans need their prophets and priests to constrain their kings. The righteous, the humane life balances all three dimensions. Christianity has indeed often been too anthropocentric, just as Christians have often been too self-centred. The need for repentance is perennial (Rasmussen 1996).

Here, religious persons, as prophets and priests, can bring a perspective of depth to nature conservation, one that science can help launch but cannot complete. With too much kings' dominion (those escalating control, consumption, exploitation concerns, also fuelled by science), we lose the world we seek to gain. Monotheists will see in forest, sky, mountain, and sea the presence and symbol of forces in natural systems that transcend human powers and human utility. They will find in encounter with nature forces that are awe-inspiring and overpowering, the signature of time and eternity. Although nature is an incomplete revelation of God's presence, it remains a mysterious sign of divine power. In the teachings of Jesus, the birds of the air neither sow nor reap yet are fed by the heavenly Father, who notices the sparrows that fall. Not even Solomon is arrayed with the glory of the lilies, though the grass of the field, today alive, perishes tomorrow (Matthew 6: 26–30). There is in every seed and root a promise. Sowers sow, the seed grows secretly, and sowers return to reap their harvests. God sends rain on the just and the unjust. 'A generation goes, and a generation comes, but the earth remains forever' (Ecclesiastes 1: 4).

Theologians claim that humans are made in the image of God. Biologists find that, out of primate lineages, nature has equipped *Homo sapiens*, the wise species, with a conscience. Ethicists, theologians, and biologists in dialogue wonder if conscience is not less wisely used than it ought to be when, as in classical Enlightenment ethics, it excludes the global community of life from consideration, with the resulting paradox that the self-consciously moral species acts only in its collective self-interest toward all the rest. Biologists may find such self-interest in our evolutionary legacy; but now, superposing ethics on biology, an *is* has been transformed into an *ought*. Ecologists and religious believers join to claim that we humans are not so 'enlightened' as once supposed, not until we reach a more inclusive ethic.

In a new century, a new millennium, with science flourishing as never before, we face a crisis of the human spirit. Central to these misgivings is the human relation to nature. In other centuries, critics complained that humans were alienated from God. In the most recent century, with its World Wars, East versus West, North versus South, critics worried about our alienation from each other. In this new century, critics are more likely to worry that humans are alienated from their planet. One may set aside cosmological questions, but we cannot set aside global issues, except at our

peril. We face an identity crisis in our own home territory, trying to get the human spirit put in its natural place.

Several billion years' worth of creative toil, several million species of teeming life, have been handed over to the care of this late-coming species in which mind has flowered and morals have emerged. Ought not those of this sole moral species do something less self-interested than count all the produce of an evolutionary ecosystem as resources to be valued only for the benefits they bring? Such an attitude today hardly seems biologically informed (even if it claims such a tendency as our inherited Pleistocene urge), much less ethically adequate for an environmental crisis where humans jeopardize the global community of life. Nor does it seem very godly. Ecologists and theologians agree: humans need a land ethic. In the ancient biblical world, Palestine was a promised land. Today and for the century hence, the call is to see Earth as a planet with promise. That might be the God's-eye view.

Even secular naturalists may be drawn toward respect, even reverence for nature. Stephen Jay Gould, for example, found on Earth 'wonderful life', if also 'chance riches' (Gould 1989, 1980), and he was moved, among the last words he wrote, to call the earthen drama 'almost unspeakably holy' (Gould 2002: 1342). Edward O. Wilson, a secular humanist, ever insistent that he can find no divinity in, with, or under nature, still exclaims: 'The biospheric membrane that covers the Earth, and you and me, ... is the miracle we have been given' (E. O. Wilson 2002: 21).

In the midst of its struggles, life has been ever 'conserved', as biologists find; life has been perpetually 'redeemed', as theologians find. To adapt a biblical metaphor, the light shines in the darkness, and the darkness has not overcome it (see John 1: 5). Science and religion join to celebrate this saga of life perennially generated and regenerated on this planet, this pearl in a sea of black mystery. We are then indeed enlightened; yet deep tragedy looms as we humans jeopardize life on Earth.

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