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Is humanity suicidal?

by Edward O. Wilson

Is humanity suicidal? Eminent U.S. zoologist and author, E.O. Wilson, first asked himself that question more than a decade ago. And today?

IMAGINE THAT ON AN ICY MOON of Jupiter – say Ganymede – the space station of an alien civilisation is concealed. For millions of years its scientists have closely watched the Earth.

Because their law prevents settlement on a living planet, they have tracked the surface by means of satellites equipped with sophisticated sensors, mapping the spread of large assemblages of organisms, from forests, grasslands and tundras to coral reefs and the vast planktonic meadows of the sea.

They have recorded millennial cycles in the climate, interrupted by the advance and retreat of glaciers and scattershot volcanic eruptions. The watchers have been waiting for what might be called the Moment.

When it comes, occupying only a few centuries and thus a mere tick in geological time, the forests shrink back to less than half their original cover. Atmospheric carbon dioxide rises to the highest level in 100,000 years. The ozone layer of the stratosphere thins, and holes open at the poles. Plumes of nitrous oxide and other toxins rise from fires in South America and Africa, collect in the upper troposphere and drift eastward across the oceans.

At night the land surface brightens with millions of pinpoints of light, which coalesce into blazing swathes across Europe, Japan and eastern North America. A semi-circle of fire spreads from gas flares around the Persian Gulf.

It was all but inevitable, the watchers might tell us if we met them, that from the great diversity of large animals, one species or another would eventually gain intelligent control of Earth. That role has fallen to *Homo sapiens*, a primate risen in Africa from a lineage that split away from the chimpanzee line five to eight million years ago.

Unlike any creature that lived before, humans have become a geophysical force, swiftly changing the atmosphere and climate as well as the composition of the world's fauna and flora.

Now in the midst of a population explosion, this species has doubled in number to more than 6 billion during the past 50 years. It is scheduled to double again in the next 50 years. No other single species in evolutionary history has even remotely approached the sheer mass in protoplasm generated by humanity.

Darwin's dice have rolled badly for Earth. It was a misfortune for the living world in particular, many of our scientists believe, that a carnivorous primate and not some more benign form of animal made the breakthrough.

Our species retains hereditary traits that add greatly to our destructive impact. We are tribal and aggressively territorial, intent on private space beyond minimal requirements and oriented by selfish sexual and reproductive drives. Cooperation beyond the family and tribal levels comes hard. Worse, our liking for meat causes us to use the Sun's energy at low efficiency.

It is a general rule of ecology that (very roughly) only about 10 per cent of the Sun's energy captured by photosynthesis to produce plant tissue is converted into energy in the tissue of herbivores, the animals that eat the plants. Of that amount, 10 per cent reaches the tissue of the carnivores feeding on the herbivores. Similarly, only 10 per cent of that is transferred to carnivores that eat carnivores. And so on for another step or two.

In a wetlands chain that runs from marsh grass to grasshopper to warbler to hawk, the energy captured during green production shrinks a thousandfold. In other words, it takes a great deal of grass to support a hawk.

Human beings, like hawks, are top carnivores, at the end of the food chain whenever they eat meat, two or more links removed from the plants; if chicken, for example, two links, and if tuna, four links. Even with most societies confined today to a mostly vegetarian diet, humanity is gobbling up a large part of the rest of the living world. We appropriate between 20 and 40 per cent of the Sun's energy that would otherwise be fixed into the tissue of natural vegetation, principally by our consumption of crops and timber, construction of buildings and roadways and the creation of wastelands. In the relentless search for more food, we have reduced animal life in lakes, rivers and now, increasingly, the open ocean. And everywhere we pollute the air and water, lower water tables and extinguish species.

The human species is, in a word, an environmental abnormality. It is possible that intelligence in the wrong kind of species was foreordained to be a fatal combination for the biosphere. Perhaps a law of evolution is that intelligence usually extinguishes itself. This admittedly dour scenario is based on what can be termed the juggernaut theory of human nature, which holds that people are programmed by their genetic heritage to be so selfish, that a sense of global responsibility will come too late.

Individuals place themselves first, family second, tribe third and the rest of the world a distant fourth. Their genes also predispose them to plan ahead for one or two generations at most. They fret over the petty problems and conflicts of their daily lives and respond swiftly and often ferociously to slight challenges to their status and tribal security.

But oddly, as psychologists have discovered, people also tend to underestimate both the likelihood and impact of such natural disasters as major earthquakes and great storms.

The reason for this myopic fog, evolutionary biologists contend, is that it was actually advantageous during all but the last few millennia of the two million years of existence of the genus Homo. The brain evolved into its present form during this long stretch of evolutionary time, during which people existed in small, preliterate hunter-gatherer bands. Life was precarious and short. A

premium was placed on close attention to the near future and early reproduction, and little else.

Disasters of a magnitude that occur only once every few centuries were forgotten or transmuted into myth. So today the mind still works comfortably backward and forward for only a few years, spanning a period not exceeding one or two generations. Those in past ages whose genes inclined them to short-term thinking lived longer and had more children than those who did not.

Prophets never enjoyed a Darwinian edge. The rules have recently changed, however. Global crises are rising within the life span of the generation now coming of age, a foreshortening that may explain why young people express more concern about the environment than do their elders. The time scale has contracted because of the exponential growth in both the human population and technologies impacting the environment.

Exponential growth is basically the same as the increase of wealth by compound interest. The larger the population, the faster the growth; the faster the growth, the sooner the population becomes still larger.

With people everywhere seeking a better quality of life, the search for resources is expanding even faster than the population. The demand is being met by an increase in scientific knowledge, which doubles every 10 to 15 years. It is accelerated further by a parallel rise in environment-devouring technology. Because Earth is finite in many resources that determine the quality of life – including arable soil, nutrients, fresh water and space for natural ecosystems – doubling of consumption at constant time intervals can bring disaster with shocking suddenness. Even when a non-renewable resource has been only half used, it is still only one interval away from the end.

Ecologists like to make this point with the French riddle of the lily pond. At first there is only one lily pad in the pond, but the next day there are two, and thereafter each of its descendants doubles. The pond completely fills with lily pads in 30 days.

When is the pond exactly half full? Answer: on the 29th day.

Yet, mathematical exercises aside, who can safely measure the human capacity to overcome the perceived limits of Earth? The question of central interest is this: are we racing to the brink of an abyss, or are we just gathering speed for a take off to a wonderful future?

The crystal ball is clouded; the human condition baffles all the more because it is both unprecedented and bizarre, almost beyond understanding.

In the midst of uncertainty, opinions on the human prospect have tended to fall loosely into two schools. The first, exemptionalism, holds that since humankind is transcendent in intelligence and spirit, so must our species have been released from the iron laws of ecology that bind all other species. No matter how serious the problem, civilised human beings, by ingenuity, force of will and – who knows – divine dispensation, will find a solution.

Population growth? Good for the economy, claim some of the exemptionalists, and in any case a basic human right, so let it run. Land shortages? Try fusion energy to power the desalting of seawater, then reclaim the world's deserts. The process might be assisted by towing icebergs to coastal pipelines.

Species going extinct? Not to worry. That is nature's way. Think of humankind as only the latest in a long line of exterminating agents in geological time. In any case, because our species has pulled free of old-style, mindless Nature, we have begun a different order of life. Evolution should now be allowed to proceed along this new trajectory.

Finally, resources? The planet has more than enough resources to last indefinitely, if human genius is allowed to address each new problem in turn, without alarmist and unreasonable restrictions imposed on economic development. So hold the course, and touch the brakes lightly.

The opposing idea to this is environmentalism, which sees humanity as a biological species tightly dependent on the natural world. As formidable as our intellect may be and as fierce our spirit, the argument goes, those qualities are not enough to free us from the constraints of the natural environment in which our human ancestors evolved. We cannot draw confidence from successful solutions to the smaller problems of the past.

Many of Earth's vital resources are about to be exhausted, its atmospheric chemistry is deteriorating and human populations have already grown dangerously large. Natural ecosystems, the wellsprings of a healthful environment, are being irreversibly degraded. At the heart of the environmentalist worldview is the conviction that human physical and spiritual health depends on sustaining the planet in a relatively unaltered state.

Earth is our home in the full, genetic sense, where humanity and its ancestors existed for all the millions of years of their evolution. Natural ecosystems – forests, coral reefs, marine blue waters – maintain the world exactly as we would wish it to be maintained.

When we debase the global environment and extinguish the variety of life, we are dismantling a support system that is too complex to understand, let alone replace, in the foreseeable future.

Space scientists theorise the existence of a virtually unlimited array of other planetary environments, almost all of which are uncongenial to human life. Our own Mother Earth is a specialised conglomerate of organisms and the physical environment they create on a day-to-day basis, which can be destabilised and turned lethal by careless activity.

We run the risk, conclude the environmentalists, of beaching ourselves upon alien shores like a great confused pod of pilot whales. If I have not done so enough already by tone of voice, I will now place myself solidly in the environmentalist school, but not so radical as to wish a turning back of the clock, not given to driving spikes into old growth trees to prevent logging, and distinctly uneasy with such world movements as eco-feminism, which holds that Mother Earth is a nurturing home for all life and should be revered and loved as

in pre-modern (palaeolithic and archaic) societies and that ecosystematic abuse is rooted in androcentric - that is to say, male-dominated -concepts, values and institutions.

Still, however soaked in androcentric culture, I am radical enough to take seriously the question heard with increasing frequency. Is humanity suicidal? Is the drive to environmental conquest and self-propagation embedded so deeply in our genes as to be unstoppable?

My short answer – opinion if you wish – is that humanity is not suicidal, at least not in the sense just stated. We are smart enough and have time enough to avoid all environmental catastrophes of civilisation-threatening dimensions.

But the technical problems are sufficiently formidable to require a redirection of much of science and technology, and the ethical issues are so basic as to force a reconsideration of our self-image as a species.

There are reasons for optimism, reasons to believe that we have entered what might someday be generously called the Century of the Environment. Conservation of biodiversity is increasingly seen by both national governments and major landowners as important to their country's future. Indonesia, home to a large part of the native Asian plant and animal species, has begun to shift to land-management practices that conserve and sustainably develop the remaining rainforests.

Costa Rica has created a National Institute of Biodiversity. A pan-African institute for biodiversity research and management has been founded, with headquarters in Zimbabwe.

Finally, there are favourable demographic signs. The rate of population increase is declining on all continents, although it is still well above zero almost everywhere and remains especially high in sub-Saharan Africa. Despite entrenched traditions and religious beliefs, the desire to use contraceptives in family planning is spreading. Demographers estimate that if the demand were fully met, this action alone would reduce the eventual stabilised population by more than two billion.

In summary, the will is there. Yet the awful truth remains that a large part of humanity will suffer no matter what is done. The number of people living in absolute poverty has risen during the past 30 years to more than 1 billion and could increase another 100 million by the end of the decade.

Whatever progress has been made in the developing countries, and that includes an overall improvement in the average standard of living, is threatened by a continuation of rapid population growth and the deterioration of forests and arable soil.

Our hopes must be chastened further still, and this is, in my opinion, the central issue, by a key and seldom-recognised distinction between the non-living and the living environments. Science and the political process can be adapted to manage the non-living, physical environment. The human hand is now upon the physical homeostat. The ozone layer can be mostly restored to

the upper atmosphere by elimination of CFCs, with these substances peaking at six times the present level and then subsiding during the next half century. Also, with procedures that will prove far more difficult and initially expensive, carbon dioxide and other greenhouse gases can be pulled back to concentrations that slow global warming.

The human hand, however, is not upon the biological homeostat. There is no way in sight to micromanage the natural ecosystems and the millions of species they contain. That feat might be accomplished by generations to come, but then it will be too late for the ecosystems. And perhaps for us.

Despite the seemingly bottomless nature of creation, humankind has been chipping away at its diversity, and Earth is destined to become an impoverished planet within a century if present trends continue. Mass extinctions are being reported with increasing frequency, in every part of the world.

They include half the freshwater fishes of the Malaysian peninsula, 10 birds native to Cebu in the Philippines, half of the 41 tree snails of Oahu, 44 of the 68 shallow-water mussels of the Tennessee River shoals, as many as 90 plant species growing on the Centinela Ridge in Ecuador and, in the United States as a whole, about 200 plant species, with another 680 species and races now classified as in danger of extinction.

The main cause is the destruction of natural habitats, especially tropical forests. Close behind, especially on the Hawaiian archipelago and other islands, is the introduction of rats, pigs, beard grass, lantana and other exotic organisms that outbreed and extirpate native species.

Those few thousand biologists worldwide who specialise in diversity are aware that they can witness and report no more than a very small percentage of the extinctions actually occurring.

The reason is that they have facilities to keep track of only a tiny fraction of the millions of species and a sliver of the planet's surface on a yearly basis. They have devised a rule of thumb to characterise the situation: that whenever careful studies are made of habitats before and after disturbance, extinctions almost always come to light.

The corollary: the great majority of extinctions are never observed. Vast numbers of species are apparently vanishing before they can be discovered and named. There is a way, nonetheless, to estimate the rate of loss indirectly.

Independent studies around the world and in fresh and marine waters have revealed a robust connection between the size of a habitat and the amount of biodiversity it contains. Even a small loss in area reduces the number of species.

The relation is such that when the area of the habitat is cut to a tenth of its original cover, the number of species eventually drops by roughly a half. Tropical rainforests, thought to harbour a majority of Earth's species (the reason conservationists get so excited about rainforests), are being reduced by nearly that magnitude.

At the present time they occupy about the same area as that of the 48 coterminous United States, representing a little less than half their original, prehistoric cover; and they are shrinking each year by about 2 per cent, an amount equal to the entire state of Florida.

If the typical value (that is, 90 per cent area loss causes 50 per cent eventual extinction) is applied, the projected loss of species due to rainforest destruction worldwide is half a per cent across the board for all kinds of plants, animals and microorganisms.

When area reduction and all the other extinction agents are considered together, it is reasonable to project a reduction by 20 per cent or more of the rainforest species by the year 2020, climbing to 50 per cent or more by mid-century, if nothing is done to change current practice.

Comparable erosion is likely in other environments now under assault, including many coral reefs and Mediterranean-type heathlands of Western Australia, South Africa and California.

The ongoing loss will not be replaced by evolution in any period of time that has meaning for humanity. Extinction is now proceeding thousands of times faster than the production of new species.

The average life span of a species and its descendants in past geological eras varied according to group (like molluscs, echinoderms or flowering plants) from about 1 to 10 million years.

During the past 500 million years, there have been five great extinction spasms comparable to the one now being inaugurated by human expansion. The latest, evidently caused the strike of an asteroid, ended the Age of Reptiles 65 million years ago.

In each case, it took more than 10 million years for evolution to replenish the lost biodiversity completely. And that was in an otherwise undisturbed natural environment.

Humanity is now destroying most of the habitats where evolution can occur. The surviving biosphere remains the great unknown of Earth in many respects. On the practical side, it is hard even to imagine what other species have to offer in the way of new pharmaceuticals, crops, fibres, petroleum substitutes and other products.

We have only a poor grasp of the ecosystem services by which other organisms cleanse the water, turn soil into a fertile living cover and manufacture the very air we breathe. We sense, but do not fully understand, what the highly diverse natural world means to our aesthetic pleasure and mental wellbeing.

Scientists are unprepared to manage a declining biosphere. To illustrate, consider the following mission they might be given. The last remnant of a rainforest is about to be cut over. Environmentalists are stymied. The contracts have been signed, and local landowners and politicians are intransigent.

In a final desperate move, a team of biologists is scrambled in an attempt to preserve the biodiversity by extraordinary means. Their assignment is the following: collect samples of all the species of organisms quickly, before the cutting starts; maintain the species in zoos, gardens and laboratory cultures or else deep-freeze samples of the tissues in liquid nitrogen, and finally, establish the procedure by which the entire community can be reassembled on empty ground at a later date, when social and economic conditions have improved.

The biologists cannot accomplish this task, not if thousands of them came with a billion-dollar budget. They cannot even imagine how to do it. In the forest patch live legions of species: perhaps 300 birds, 500 butterflies, 200 ants, 50,000 beetles, 1,000 trees, 5,000 fungi, tens of thousands of bacteria and so on down a long roster of major groups.

Each species occupies a precise niche, demanding a certain place, an exact microclimate, particular nutrients and temperature and humidity cycles with specified timing to trigger phases of the life cycle. Many, perhaps most, of the species are locked in symbioses with other species; they cannot survive and reproduce unless arrayed with their partners in the correct idiosyncratic configurations.

Even if the biologists pulled off the taxonomic equivalent of the Manhattan Project, sorting and preserving cultures of all the species, they could not then put the community back together again. It would be like unscrambling an egg with a pair of spoons.

The biology of the microorganisms needed to re-animate the soil would be mostly unknown. The pollinators of most of the flowers and the correct timing of their appearance could only be guessed. The 'assembly rules', the sequence in which species must be allowed to colonise in order to coexist indefinitely, would remain in the realm of theory.

In its neglect of the rest of life, exemptionalism fails definitively. To move ahead as though scientific and entrepreneurial genius will solve each crisis that arises implies that the declining biosphere can be similarly manipulated.

But the world is too complicated to be turned into a garden. There is no biological homeostat that can be worked by humanity; to believe otherwise is to risk reducing a large part of Earth to a wasteland.

The environmentalist vision, prudential and less exuberant than exemptionalism, is closer to reality. It sees humanity entering a bottleneck unique in history, constricted by population and economic pressures.

In order to pass through to the other side, within perhaps 50 to 100 years, more science and entrepreneurship will have to be devoted to stabilising the global environment. That can be achieved, according to expert consensus, only by halting population growth (and it's already slowing) and devising a wiser use of resources than has been accomplished to date.

And wise use for the living world in particular means preserving the surviving ecosystems, micromanaging them only enough to save the biodiversity they

contain, until such time as they can be understood and employed in the fullest sense for human benefit.

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