

Education in the Age of Ecological Uncertainty

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The problems facing the global environment are well documented. If today is a typical day on planet earth, humans will add fifteen million tons of carbon to the atmosphere, destroy 115 square miles of tropical rainforest, create seventy-two square miles of desert, eliminate between forty to one hundred species, erode seventy-one million tons of top soil, and increase their population by 263,000. Yesterday, today and tomorrow.

Looking into the future, three crisis are looming The first is a food crisis evident in two curves that intersect in the not to distant future: one showing worldwide soil losses of twenty-four billion tons, the other a rapidly rising world population, the fear being, not that these two curves will meet, but they will race past each other leading a trail of devastation it their wake, devastation felt now by the 20 percent of the worlds hungry who, because of the grossly inadequate distribution systems for the worlds resources, go to bed hungry.

The second crisis on the horizon is that caused by the end of the era of cheap energy. We are in a race between the exhaustion of fossil fuels, global warming, and the transition to a new era based on efficiency and solar energy. The third crisis, perhaps symbolized best

by the looming prospect of global climate change, has to do with the ecological thresholds and the limits of natural systems. We can no longer assume that nature will be bountiful or stable or that the earth will remain hospitable to civilization as we know it

The three crisis feed upon each other and interact in ways that we cannot fully understand. Together they constitute the first planetary crisis, one that will spur humans to unsurpassed cooperation and environmental awareness or bring about our demise. Given that the changes that are occurring now are leaving their mark on the geological record, it is not hyperbole to dub the next 100 years the century of the environment.

The exponential breeding of 6 billion people and the process of fulfilling their wants and needs is stripping the earth of its biotic capacity to produce life: a climatic bust of consumption by one species is overwhelming the skies, earth, waters and fauna. As increasing numbers of species become extinct or exist as pathetic shattered remnants, it is as if we are being marched frog step down the Cenozoic towards the Cretaceous, the tremendous surge in living organisms over the last sixty five million years being snuffed out in an instant

Despite a facade of optimism many of the statistics are grim. One measure of our impact on the planet is provided by estimating the net primary production (NPP) of the planet which is defined as the sum of all photosynthetic production minus the energy required to main-

tain the trees and plants on which it is based. The annual figure arrived at is in the area of 225 billion metric tons of wood, grass, fiber, and food. Of this total, 60% is produced on the lands and 40% in the oceans. One study suggests that the human economy currently utilizes, consumes, converts, burns, or clear cuts annually 40 % of the total NPP on the land. If, as predicted, our population doubles sometime in the next forty or fifty years, we will utilize 80% of the primary production of the planet. If the global standard of living doubles in the next forty years, as many predict it will do so, then we will quadruple our impact - a physical impossibility. It is as if, as one writer suggested, a sphere, representing the greater ecosystem, contains within it a cube - the human economy - and that cube is growing to such an extent that its corners are beginning to pierce the surface. If these numbers are accepted as a good first order approximation, and I have not seen any studies suggesting otherwise, then human activities may be pressing closer to the biological limits of the planet than is generally accepted those who promulgate business as usual.

Global warming also suggests that another limit of a sort is being reached with the last decade being the hottest on record. "The worlds climate system is an angry beast and we are poking it with sticks." While the details are unclear most scientists agree that continue to fill the Earth's atmosphere with heat trapping gases they will, in fact, trap heat. The debate instead is how much warming is acceptable, whether the changes will be linear or exponential as other factors - the switching of the gulf stream or the release of methane from the

permafrost to name but two - kick in. Current policies are attempting, unsuccessfully, to freeze carbon dioxide levels at their 1990 levels while the scientists who work for United Nations Intergovernmental Panel on Climate Change (IPCC) have stated unequivocally that in order to stabilize the climate carbon dioxide emissions should be lowered globally to 40 % of their 1990 levels. Since much of the energy being used in developing countries serves vital needs then it behooves us in wealthy countries to consider cut - backs by eighty to ninety percent. Unfortunately it is hard to imagine what sort of economy would remain under these conditions. Certainly our lifestyle would face a massive challenge. Given these figures we can understand the words of a major EC official - a man responsible for advising European governments on their energy policy: "If the IPCC scientists are right, then we are on the Titanic, and the only question that remains is whether we go first class or steerage. I prefer first class."

Despite these and other disquieting facts, the slew of bad news that makes up the news these days the environmental crisis feels far off. Our nervous systems, evolving over 570 million years and reaching their final flowering in the late Pleistocene, 13,000 years ago are designed to respond to immediate threat and tangible stimuli. The invisible build up of carbon dioxide (0.035% of the air we breath) or environmental hormones (active at concentrations as low as 35 parts per trillion) is beyond our sensory perception as is the decline of species and habitat in areas far from the urban areas in which we live. When we are aware of what is going on - another river dammed

and lined with cement so that patronage politics can continue as usual, an area of woods we enjoyed hiking through bulldozed for a “park,” the hardware store selling rainforest wood pilfered from tribal lands, factory farmed poultry fed on fecal matter and tortured in tiny boxes - all the usual indignities of daily life in the early 21st century Like a patient in denial we keep ourselves numb. One does not rock the boat after all. Somehow talking about the environment, or worse translating that talk into action is deeply impolite - the equivalent as Chomsky once said, a propos criticizing America’s foreign policy, of using the “F” word at a dinner party. Rather than forming the basis for revitalizing our society -for issuing new steering orders to the Titanic - the debate ebbs and flows in a myriad journals and well intentioned books.

The horror of the prior century with “its great depression and the vast displays of totalitarianism; World War II, its massive battles with thousands of tanks and hundreds and thousands of prisoners; the armadas and invasions. Hiroshima and Nagasaki, Bikini, brighter than a thousand suns. Religious wars in India and Palestine, roads packed with refugees, displaced persons. Superpowers, superhighways, supertankers, supermarkets, superbowls. Olympian spectacles, the whole world watching TV at once. Urban conglomerates of ten, twelve, fifteen million persons. Extermination of peoples in Biafra, Bangladesh, the Sudan, Ethiopia. Titan missiles, space shots, megatons of thrust. Defoliation, mile-long accelerators high-energy physics, fission fusion and superconductivity. Corporate multinationals. Gigantism in agriculture, in commerce and trade, in archi-

ture. Universities of sixty thousand students. Trillion dollar budgets and calculators that can chew off and bite those enormities. Mind expanding drugs, cocaine highs, mushroom clouds and mushroom visions. Decibels of rock. Annual broken records in pole vault and discus and 100 yard dash – higher, farther, faster. Population explosion. Suburbia sprawling, miles and miles of urban squalor, burning cities, burning forests, homelessness and hunger. Gargantuan consumerism. Garbage barges, garbage dumps, dead fish, dead skies and ageless species exterminated en masse.” as James Hillman expressed is at once too enormous and tragic to contemplate. The only possible response seems to be one of denial.

Given the impact that the environment will have on the way our society will be structured in the 21st century it is germane to ask how the education system is responding to this. The answer as David Orr, an American educator, puts it “we continue to educate the young for the most part as if there were no planetary emergency.” He argues “It is widely assumed that environmental problems will be solved by technology of one sort or another. Better technology can certainly help but the problem is not first and foremost one of technology. Rather, it is a crisis within the minds that develop and use technology. The disordering of ecological systems and the great bio-geochemical cycles of the earth reflects a prior disorder in the thought, perception, imagination, intellectual priorities, and loyalties inherent in the industrial mind. Ultimately, then, the ecological crisis concerns how we think and the institutions that purport to shape and refine the capacity to think.”

A somewhat more cynical argument might be that for the most part much of what occurs under the auspices of education is irrelevant. The classrooms forming a means of control, a place where teenagers can be grouped and babysat until they are deemed old enough to take their place in the work force. The real education is taking place on the T.V. the massive amount of advertising absorbed nightly, portrayals of redemption before the idol of consumerism, the flickering dreams of paradise on the screens of a million homes. Educators, for all their much vaunted objectivity, do not stand outside of society therefore it is doubtful if there is any reason why we should expect our universities to be centers of change - instead when faced with the implications of environmental research there is a retreat into abstraction. The academic system, after all, does not expect us to act on our knowledge, in fact given the disturbing nature of the data that is pouring in, it had better not. It is permissible for a scientist to suggest that Western societies should reduce their carbon dioxide emissions by eighty percent, to use a previous example, but to try to build a curriculum based on the meaning of that knowledge would be dangerous indeed. Rather than trying to educate our students in the skills they will need in order to sustain an environmentally harmonious world it is safer for example to spend money on computers - an area which dovetails with manufactures interests and provides intimacy with an icon of technological progress. The benefits or otherwise of computers, the politics of the machine, are rarely debated. Quizzing people on the political biases of their artifacts is considered ill mannered.

More worrying is the possibility that our educational system is not only irrelevant but it is also harmful. That there is something alienating in the symbol manipulating mathmatico-grammatical mindset of the modern educational system that produces people highly skilled at fitting into a society optimized for consumption but with little concern or empathy for the environment. Ecological wisdom, the ability to live in a place without damaging it, requires that certain members of our complex society process analytic skills but is dependent on a more fundamental human tendencies of empathy, and moral decency. It is ironic that there are many examples of illiterate (but highly educated) primary people who lived without destroying the natural world on which they were dependent but no technologically based society that has yet managed to do so. When considering the future it is alarming to consider that many of the Arcadian utopias of the past fail on analysis; history is littered with agricultural societies that overshot their resource base, while consigning their members to "the idiocy of rural life". Prehistory contains examples of Pleistocene overkill and the decimation of North Americas megafauna. Examples of sustainable living are also vanishing as primary people still living these lifestyles are being coerced into adopting Western lifestyles or having their resource base stolen from under them.

Part of the problem is that the traditional education was not designed to engage students with nature. Instead any contact with the natural world sits uneasily with the prerogatives of regulated classroom time, the desire for quantitative testing, the abstraction that is

demanding. Because of the pressures of work on parents, the lack of suitable recreational area and the desire that young children enter elite schools, even very young children are denied contact with nature. Growing up surrounded for the most part by man made objects and exposed to video games and television shows, growing up in an artificial sensorium it is little wonder that the artificial is increasingly preferred.

E.O. Wilson (1984) states that: "people can grow up with the outwards appearance of normality in an environment largely stripped of plants and animals, in the same way that passable looking monkeys can be raised in laboratory cages and cattle fattened in feeding bins. Asked if they were happy, these people would probably say yes. Yet something vitally important would be missing, not merely for the knowledge and pleasure that can be imagined and might have been, but the wide array of experiences that the human brain is particularly equipped to receive." Like Paul Shepherd and Theodore Rozark he argues that human mind developing as it did on the plains of the Africa is evolved so that full mental health is only within the context of a natural ecosystem (and presumably the hunter-gatherer lifestyle that went with it. The evidence for this seems somewhat weak - peoples desire to keep pets, a delight in savanna landscapes - and despite the best wishes of the authors does not seem enough to launch an ecological renaissance. For example children's interest in animals in the right environment may result in them becoming naturalists but seems to be easily deflected into electronic toys (Tamagochi), video games (Sonic the hedgehog), and cartoons

(Mickey Mouse). while people who are raised in pristine landscapes without the requisite moral and ethical training cheerfully trash them or cash them in given the technology to do so and a market to trade in.

The least we can say is that *Homo sapiens*, the weed ape is a highly flexible generalist, culturally malleable, and the human mind is capable of being imprinted both socially and experientially so that a wide variety of cultural divergence can be observed. Brown (1992), inspired by Chomsky's Universal Grammar (UG) attempted to build up a list of attributes that could be found common to all cultures to build a model of Universal People (UP). Attributes as diverse as interpreting dreams, fear of snakes and use of drugs were found across all cultures Unfortunately an injunction to live peacefully with nature was not.

Even if human beings are growing increasingly uneasy within their artificial world, and the increasing amount of mental illness, violence, and enthusiasm for destructive religious cults suggest that such uneasiness is increasing, then as one technological pessimist pointed out, "our society tends to regard as "sickness" any mode of thought or behavior that is inconvenient for the system and this is plausible because when an individual doesn't fit into the system it causes pain to the individual as well as problems for the system. Thus the manipulation of an individual to adjust him to the system is seen as a "cure" for a "sickness" and therefore as good." Because it is easier to medicate a dissatisfied individual rather than alter society,

and because of the pressures that human beings, herd animals, feel to remain part of society, – quite apart from the economic necessity to do so – then it is probable that feelings of unease caused by contemporary society will be medicated away rather than used as a stimulus for change.

Orr (1994) gives as a basic list of the analytical and academic items “that no student should graduate from any educational institution without” These include:

1. the laws of thermodynamics,
2. the basic principles of ecology,
3. carrying capacity,
4. energetics,
5. least cost, end-use analysis,
6. limits of technology
7. appropriate scale,
8. sustainable agriculture and forestry,
9. steady state economics, and
10. environmental ethics.

and mentioning that he also wants to add “practical things necessary to the art of living well in place... Collectively, these are the foundations for the capacity to distinguish between health and disease, development and growth, sufficient and efficient, optimum and maximum, and “should do” from “can do.”” Although each of the topics given above could be competently taught at the high school level it is interesting to consider how esoteric they appear and the

difficulty of pigeonholing them into subject matter as it is taught today. Under what subject category could students discuss “appropriate scale” for example or “the limits of technology.”

Given the ecological constraints on our society that the Earth – a bounded system open to energy and closed to material flow – imposes, human society will be forced to adapt. Paul Hawken (1993), writing for a North American audience, gives a set of objectives necessary for creating a society that is sustainable. They are as follows:

1. Reduce absolute consumption of energy and natural resources in the North by 80 percent within the next half century. This is not as difficult as it sounds. In material terms it amounts to making things last twice as long with half the resources. We already have the technology to do this in most areas, including energy usage.
2. Provide secure, stable, and meaningful employment for people everywhere. Moving towards sustainability and not addressing job creation will exacerbate economic hardship and further degrade resources. Asking people to reduce consumption without increasing employment will create a world as destructive as the one they would replace.
3. Be self-actuating as opposed to regulated or morally mandated. Some people sincerely believe that the rate we’re losing life on earth calls for the imposition of higher “rights” than those consti-

tionally recognized in democracies. Even if we agree that we should put aside certain human liberties for a greater good, there is still a crucial flaw in this argument. Government has a crucial role to play, but that role must coincide with the natural impulses in society. Humans want flourish and prosper, and they will eventually reject any system of conservation that interferes with these desires.

4. Honor market principles. No “plan” to reverse environmental degradation can be enacted if it requires a wholesale change in the dynamics of the market. We have to work with who we are – which includes our strong instinct to shop the market and buy products of comparable quality at the lowest price. We can’t ask people to pay more to save the planet. They won’t do it in some cases – and can’t in most.
5. Be more rewarding than our present way of life. We need to invite people into a world that delivers the goods, not subtracts them, that intrigues without threatening; in which they can participate, enjoy, and create. Present-day limits need to become opportunities.
6. Exceed sustainability by restoring degraded habitats and ecosystems to their fullest biological capacity. The dirty secret in environmentalism is that there is no such thing as sustainability. Habitats can endure over millennia, but its practically impossible to calculate the sustainability of specific fisheries, tracts of land,

and actual forests. We have also probably passed the point where present planetary resources can be relied on to support the population of the next forty years. Any viable economic program must turn back the resource clock and devote itself actively to restoring damaged and deteriorating ecosystems - restoration is far more compelling than the algebra of sustainability.

7. Rely on current income. Sustainable human communities should act like natural ones, living within a natural ebb and flow of energy from the sun and planets. This doesn't mean being cold and hungry in winter, but redesigning all industrial, residential, and transportation systems so that everything we use springs easily from the earth and returns back to it.
8. Be fun and engaging, and strive for an aesthetic outcome. Government, business, and environmental organization cannot create a sustainable society. It will only come about through the accumulated daily acts of billions of eager participants. Some think that humans are predatory by nature. I cast my vote with those who feel humans take the shape of their culture and that shifts in culture can occur in rare moments with remarkable speed and vigor. Good design can release humankind from its neurotic relationship to absurd acts of destruction and aim it towards a destiny that is far more "realistic" and enduring. The urge to create beauty is an untapped power, and it exists in commerce as well as society.

The education required to bring about these changes is already in place in rudimentary forms around the world. In the first instance it would require greater attention paid to the basic laws of ecology and greater attention paid to aesthetic design and science that preserves the world. This much is well known and can be accommodated, with some adjustments within the traditional curriculum. Abstract knowledge alone however, is probably not enough to heal the split. What is required is an institution in which the core values are environmental—where everything from the architecture to the food served in the cafeteria reflects the emerging environmental culture. As Orr (1992) mentions "All education is environmental education" as the environment exists whether it is taught about or not. All our education—in the fullest sense of the word—does is determine how the environment is treated.

References

This essay is heavily debted to the following works. Interested readers are referred to the works by David Orr for a comprehensive discussion of the true meaning of education in an ecologically sustainable society.

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