Part V

Conclusions

13 Assuming 'responsibility for our rose'

Jim Dator

Introduction

Humans were once a tiny part of nature, no more consequential than any of the other flora and fauna of Earth and substantially less numerous or powerful than most. However, over the millennia, and especially over the last several hundred years, and most especially the last few decades, humans have become the dominant species on Earth (Turner 1990; Willis 1998; Smil 2002; Williams 2003). We have transformed what was once a 'natural' environment of which we were only a small part into a largely and increasingly 'artificial' environment of our own creation.

It is of utmost importance that we understand this change in the human position, and our pressing and novel responsibilities for the future which follow from it, whether we like it, or are ready for it, or not. As Walter Truett Anderson notes in the frontispiece to his seminal book, *To Govern Evolution*, Antoine de Saint-Exupery wrote: 'People have forgotten this truth, but you must not forget it. You become responsible forever for what you have tamed. You are responsible for your rose' (Anderson 1987: vii).

I am sceptical of humanity's ability to avoid environmental and social disasters. The evidence from palaeontology, anthropology and history testifies that humans routinely over-exploit their environment. We then: (1) either move on to other environments which we then over-exploit also; (2) die off locally; or (3) create new technological solutions that provide a fix but one which is purely temporary and after which inevitably starts the cycle of migration, death or new technology all over again. If there are any constants in humanity's record, this cycle seems to be one (Diamond 1992; Tudge 1996; Flannery 1999; Stiner *et al.* 1999; Murray 2003; Kerr 2003; Jackson *et al.* 2001).

Humanity is now nearing the end of a cycle of environmental challenge and technological response. But this time the challenge may be too much since the cycle is global in scope in many aspects while still local, if not purely individual, in others. Environmental, economic, technological and health factors are global, but our governance systems are still based on the nation state, while our economic system ('free-market' capitalism) and many national political systems (interest-group 'democracy') remain profoundly individualistic in input, albeit

tragically collective in output. In both economics and governance, we individualise gains and socialise loses.

There are many potential technological fixes for our current dilemma, but it is unclear whether they will be brought online soon enough to prevent ecological collapse, or at least to prevent major wrenching changes in the lifestyles and lifespans of people in so-called 'developed' countries. Many people hope such changes can be achieved, some believe they will be, and some fewer still are struggling to make it so (Goldemberg 2001; Deffeyes 2001; De Leo *et al.* 2001; Hoffert *et al.* 2002; Myers 2000; Rees 2003; Worldwatch Institute 2002).

But much more importantly, it is unclear whether humanity should be encouraged to seek a solution to our problems through new technologies if that enables humanity to continue our path of perpetual consumption, global environmental destruction and unanticipated social transformation. This is especially the case when we consider the high probability that some humans will leave Earth by the late twenty-first century, thus transporting our human propensities to the inner solar system and potentially throughout the cosmos. If humans are, as it seems, planet eaters, isn't one planet enough? When I raise this question I often ask people to supply the missing letters in the following sentence:

> What a piece of **** is a man!

Many, immediately recognising the line from Shakespeare, shout out, 'work'!

> What a piece of work is a man!
> How noble in reason! How infinite in faculty!
> In form and moving, how express and admirable!
> In action, how like an angel!
> In apprehension how like a god! The beauty of the world!
> The paragon of animals!
> And yet, to me, what is this quintessence of dust?
>
> (*Hamlet* II, ii)

Others, contemplating the long and tragic destruction of our environment by this 'quintessence of dust', supply another four letter word. We are a piece of stinking shit; a cancer on our otherwise beautiful mother, Earth; a cancer that should be removed, and will be, one way or another. Grim conclusions, indeed! Well supported by the facts. And yet, where do these ethical doubts come from except from the mind and spirit of humans? It is we humans who worry about our unsavoury history and our ambiguous futures. And so, we humans – technologically strong while ethically weak – are all we have to work with. Thus I put my efforts, as I believe we all should, albeit almost certainly in vain, towards enabling humanity to continue to evolve by transforming Earth and ourselves into something different from what either has been so far.

We may not be able to achieve such a positive transformation. But I see no other alternative. It is far too late, it seems to me, to stop, go back, and let

'nature' resume dominion over us, however comforting that thought might be. It is far too late for that. I conclude that we must learn to become 'responsible for our rose'. We must acknowledge that 'nature' is gone. 'Nature', in the sense of places and processes uninfluenced by human actions, no longer exists, and those places where the impact of human actions is still small will rapidly decrease in number and importance until all of Earth, as well as all of society, will be 'artificial' and require continual human invention, creation, maintenance and re-imagination; that the task of ethics and governance from now on is, as Walt Anderson said, 'to govern evolution'. The evidence that humanity has already transformed the Earth into an entirely artificial creation seems irrefutable. The evidence that humanity will take responsibility for having caused this transformation, and will strive to govern evolution, is as of yet slight, but not entirely non-existent as I will try to demonstrate below.

Biosphere one and a half: living in an artificial world

Humanity has no doubt become a major force on Earth. Walter Truett Anderson summed up the issue at hand most clearly some time ago:

> Evolution no longer follows the Darwinian rules that provided, for over a century, our best understanding of it. It is no longer an impersonal and mechanistic process obeying the remorseless logic of natural selection. That vision is as obsolete as its first cousin, Newton's clockwork cosmos. Today the driving force in evolution is human intelligence. Species survive or perish because of what people do to them and to their environments. The land and air and water system are massively altered by humankind which has become, as one scientist put it, ' a new geological force'. Even our own genetic future is in our hands, guided not by Darwinian abstractions but by science and medical technology and public policy. The world has changed; and the human species, which has wrought the change, is now being required to change in response to the conditions we have created.
>
> (1987: 2)

Anderson continued:

> I am not here to argue that the human species ought to take responsibility for evolution on the planet, and begin through public and private institutions to make collective decisions about such matters. If that were the question to be decided I would advocate that we put it off for a few centuries or more – let things run themselves while we get accustomed to the idea of evolutionary governance, develop the appropriate ethics and myths and political structures, and perhaps mature a bit. However, that is not the question before us, since we are already governing evolution. This is the great paradox about the threshold: It is not out there ahead of us somewhere, a line from which we might conceivably draw back. We are well

> across it. To say that we are not ready for evolutionary governance is equivalent to saying that a teenage child is not ready for puberty; the statement may be true, but it is not much help.
>
> (1987: 3)

Colin Tudge devotes a chapter of his book, *The Time before History*, to demonstrating that 'a huge number of creatures all over the world disappeared during the late Pleistocene and continued to die out en masse well into modern times … this die-off coincided with the spread of human beings around the world'. 'The charge is that the deaths of those animals were caused by the diaspora of modern humans…' (Tudge 1996: 283). After detailing the carnage in some detail, Tudge concludes:

> And now the pace of extinction has increased. Now the world is so arranged, if 'arrangement' is the word, that the existence of every other creature is to some extent in our hands. The animals that serve us directly are overwhelmingly successful, if the criterion of success is indeed the replication of their genes, for cattle and chickens are far more numerous than they would ever have been in untamed nature. By contrast, the species for which we have no use are pushed aside – unless they discover some human niche, as aphids and rats have done, and become 'pests'. So now we have the world at our feet – where do we go from here?
>
> (Tudge 1996: 314)

An extensive survey of 'Human Dominated Ecosystems' published in *Science* in turn opened with these words (Vitousek *et al.* 1997)[1]:

> All organisms modify their environment, and humans are no exception. As the human population has grown and the power of technology has expanded, the scope and nature of this modification has changed drastically. Until recently, the term, 'human-dominated ecosystems' would have elicited images of agricultural fields, pastures, or urban landscapes; now it applies with greater or lesser force to all of Earth. Many ecosystems are dominated directly by humanity, and no ecosystem on Earth's surface is free of pervasive human influence.
>
> (1997: 494)

> The global consequences of human activity are not something to face in the future – they are with us now. All of these changes are ongoing, and in many cases accelerating; many of them were entrained long before their importance was recognized. Moreover, all of these seemingly disparate phenomena trace to a single cause – the growing scale of human enterprise. The rates, scales, kinds, and combinations of changes occurring now are fundamentally different from those at any other time in history; we are changing Earth more rapidly than we are understanding it. We live on a

> human-dominated planet – and the momentum of human population growth, together with the imperative of further economic development in most of the world, ensures that our dominance will increase….
>
> (1997: 499)

> [H]umanity's dominance of Earth means that we cannot escape responsibility for managing the planet. … There is no clearer illustration of the extent of human dominance of Earth than the fact that maintaining the diversity of 'wild' species and the functioning of 'wild' ecosystems will require increasing human involvement….
>
> (1997: 499)

> In a very real sense, the world is in our hands – and how we handle it will determine its composition and dynamics, and our fate.
>
> (1997: 499)

Through a glass darkly: all reality is virtual

Society is a social invention, and not an objective entity that impresses itself the same way on everyone. What we think we know about the world, we know almost entirely because of the way it has been constructed for us by our culture – its myths and beliefs, our language, our family, school, religion and our own (often false) personal experiences and memories of them.

Whatever may be objectively 'real', 'out there', will never be fully known to us except by the devices and metaphors through which it is constructed by each human community. All cultures tell stories, make up dramas and plays, carve statues and form other visual images, sing songs, beat drums, blow horns, invent rituals, give explanations for events, and in many other ways embellish the bare 'facts' of 'real' sensory experience. And since the stories one culture tells often differ markedly from the ones other cultures tell, people often live in very different realities constructed by their language and culture. Recently we have become more extraordinary storytellers because of new technologies that have made story telling more vivid and multi-sensory than was possible in the old days when we could only speak, sing, dance, carve, mould or paint. The printing press made the 'fiction' possible. Before that very few merely popular 'stories' were ever written down. Some were, but writing was preserved for 'serious' and 'real' things such as laws, religious documents, economic accounting and pornography (Goody 1977, 1986, 1997, 2000; Havelock 1986; Ong 1982; Olson and Torrance 2001; Pesce 2000).

But with the invention and then widespread use of the printing press during the sixteenth and seventeenth centuries, for the first time information and disinformation became relatively cheap and abundant; not only serious fact and ennobling fiction, but also 'trashy' novels began to flow forth, first as a trickle and then as a flood. And with the subsequent invention of the public school system where everyone was taught how to read or write, more and more people

began to read and write whatever they preferred. While that might be law, religious documents and scientific tomes for some, it was 'frivolous' fiction for most (McLuhan 1962; Eisenstein 1979; Katsh 1989).

And then, amazingly enough, entire academic departments arose in colleges and schools devoted to the teaching of fiction – of amusing and well-crafted falsehoods – requiring students to deal seriously with worlds that were not 'real'. Thus, during the eighteenth and especially nineteenth centuries, more and more people began to spend more and more of their time in fictional places – in virtual realities – and not in the 'real' reality of their five senses. In the twentieth century came the radio, and movies, and television, and board games (such as Monopoly), and video games, and *Sim City*, and *MYST*, and … eventually, in the twenty-first century, 'Virtual Reality', perhaps along the lines of the three-dimensional 'Holodec' of the American television series, *Star Trek* (see Rheingold 1991; Rucker *et al.* 1992; Zizek 1997; Levy 1998; Fink 1999; Weimann 2000; Packer Jordan 2001; Woolgar 2002).[2]

All of this teaches more of us how to live in many alternative presents, as well as to be prepared for many alternative futures. All of this also helps us gain perspective, distance and perhaps criticism from the 'crackpot realism' which 'authoritative' rulers, priests, teachers and parents may wish to impose on us. We can and do 'escape' from the reality of our everyday lives by reading, watching television, playing video games. Indeed, most of us when asked to explain something will give an example, not from our everyday 'real' lives, but from a movie or TV show we have seen. Mediated reality is far – FAR – more real for most of us than is actual reality.

Embracing our sibling artilects: co-existing with artificial intelligence

In 1997, after many years of trials and tests, a computer program called 'Big Blue' defeated the world's chess champion and a new era in artificial intelligence (AI) seemed to have been born. Since then, other computer programs have been developed which seem able to defeat the very best human intelligence in every game ever invented, including, eventually (although not yet), the Japanese game 'Go' which may be the most complex game of all.

Even today, much, increasingly most, of the world is controlled by autonomous artificial rules and processes that present us with decisions which often we literally must follow without question – our very lives depend on it – or which, when we do try to override, turn out to have been the decision we too would have reached if only we had had the time. We increasingly use computers to make decisions for us in situations where it is too dangerous for humans to go, or where it takes humans too long to decide. Given the speed of transport, and especially the speed of light at which all information travels, we increasingly have to leave split second decisions up to machines, just so we humans can survive. We are also making 'smart' everything – smart houses, smart cars, smart birthday cards, smart weapons.

Even the term 'artificial intelligence' is itself a swiftly moving target. It is, as David Miller (1998) argues, 'whatever machines haven't learned to do yet'. Miller argues that the intelligence (sensing and decision-making ability) currently in your microwave would have been termed AI twenty years ago. Now it is not, and AI is something even smarter – something which a machine can not yet do (but soon will).

Susantha Goonatilake, Ray Kurzweil and Ian Pearson believe that AI that surpasses human intelligence may lie just around the corner, in the early twenty-first century, evolving by the very practical and almost invisible processes just described. Soon, in the mid twenty-first century, humans will realise that they are only one of a myriad of intelligent entities on Earth. Some humans will choose to merge with AI to form various kinds of cyborgs. Some humans will link AI to biologically modified beings, and then both to human beings and human intelligence. Some humans will insist on staying pure and 'natural'. And some AIs might be wise enough to 'reject' any contamination from either human or other engineered biosystems, recognising that biology is just a halfway house, if not ultimately a handicap, and that the only good intelligence is bio-free intelligence, electronically linked throughout the globe, the solar system and, eventually, throughout the galaxy (see Breazeal 2002; Brooks 2002; Goonatilake 1999; Kurzweil 1999; Gershenfeld 1999; Moravec 1999; Pearson 2002; McNally and Inayatullah 1988; Dator 1989, 1990).[3]

We are all cyborgs now: genetic/prosthetic enhancement

The most powerful technologies of the twenty-first century may well be generated by biological engineering. Whatever coal and iron did for the nineteenth century, and oil and the electron did for the twentieth, genes and their related proteins, enzymes, sugars and other chemicals may do for the twenty-first – and much, much more.

It has been said that we presently live in an 'information age'. Maybe so, but the ultimate information, that dealing with the structure and processes of life itself, is being better and better understood daily. Old forms of life are being modified, and new forms of life are being hatched. We are only beginning to enter the true 'Information Age' of biological engineering. Even though some people and groups may be opposed to biological engineering – and there are many, and often very good, reasons for concern – trying to stop biological engineering is more like trying to stop abortions or recreational drug use than it is like trying to stop nuclear generating plants. Much biological engineering is comparatively easy to do 'in your kitchen', and some of it is driven by a desire to 'correct' a behavioural 'defect' in one's self or one's child, and then to 'improve' the performance of one's self or one's child. It is very private, very emotional and extraordinarily powerful.

These technologies are certainly subject to misuse, and they will be misused. But they *will* be used, somewhere, by someone in the world. While progress in

one place can be slowed and influenced, and perhaps it should be, it cannot be stopped everywhere. Moreover, biological processes will be manipulated in essentially all living organisms – from humans, to other animals, to plants grown for food, to all plants everywhere in the world and under the seas.

Manipulating biological processes influences a lot of the behaviour of an organism, although certainly not *all* of the behaviour. The role of the environment in shaping the behaviour of each individual organism, and a species, is great. Clearly the interaction between environment and biology is key to the behaviour of any organism. Indeed, the more scientists learn about genetic and other processes, the more complicated biological engineering seems to become – at first. But manipulating genes and their related processes clearly gives humans much more power over the future of life than does manipulating the environment alone. And we have already seen that humans are controlling more and more aspects of all environments everywhere. Biological engineering is just one more – very big – step towards artificiality in all domains (Stock 2002; Fukuyama 2002; Wilmut *et al.* 2000; Gray 2001; Anton *et al.* 2001; Mulhall 2002; Sager 2001; Justman *et al.* 2002).

Do it yourself genesis: new materials and molecular engineering

In 1986, Eric Drexler wrote *Engines of Creation* in which he described the potential power of self-replicating machines that could be created the size of molecules – the smallest physical units of elements and compounds – and then set loose to do whatever they were designed to do, free from further human intervention (Drexler 1986). Nanotechnology has been the subject of considerable research, speculation, hope and some fear since then. After being viewed initially as just another ridiculous science fantasy (like any ultimately useful idea about the future), nanotechnology eventually caught the attention of the scientific/engineering establishment, and since the first years of the twenty-first century has begun to receive serious funding from such mainstream organisations as the US National Science Foundation:

> In 2001, scientists assembled molecules into basic circuits, raising hopes for a new world of nanoelectronics, a feat *Science* selects as the 'Breakthrough of 2001'. If researchers can wire these circuits into intricate computer chip architectures, this new generation of molecular electronics will undoubtedly provide computing power to launch scientific breakthroughs for decades.
>
> (Anon 2001: 2442)

At the same time, critics of nanotechnology (and of the other two technologies we are focusing on here – AI and biological engineering) have become more vocal. One of the most important critics, Bill Joy, recently published a powerful piece titled 'Why the Future Doesn't Need Us' (Joy 2000) in the high-tech Bible, *Wired*.

If the more advanced claims about nanotechnology prove feasible, all bets are off. Since there is no such thing as 'waste' (all molecules, whatever their provenance, are raw material to be restructured into something else via nanotechnologies), the old world of scarcity will be over, as will be the old ways of producing food, clothing, automobiles, buildings – well, everything. The energy requirements of nanotechnologies also are insignificant compared to those of contemporary industrial technologies. And since humans won't need to pay much attention to the manufacturing processes, it provides even more reasons why we should begin thinking seriously about moving towards a peaceful, prosperous and meaningful world without work.

But whether or not that dream can be achieved, the point here is that nanotechnology is one more very important brick in the wall of artificiality. Molecular engineering controls matter at its smallest level, allowing the creation of countless 'machines' to carry out countless processes that only nature – and often not even nature – can currently do. As the originator of the idea of nanotechnology, Richard Feynman, said many years ago, 'there is plenty of room at the bottom'. This is grassroots, decentralised, individualised development at its finest and most powerful (and/or scary).

Not with swords loud clashing: space exploration and settlements

Even though the fortunes of NASA and the space agencies of other countries rise and fall with rising and falling economic, political and ideological fads and fashions, and even though the USA seems hell-bent on militarising space against all reason, I remain hopeful that during the course of the twenty-first century humans will establish permanent settlements on the Moon and Mars, and perhaps also on artificial satellites stabilised at various Lagrange points. It is also likely that over the subsequent centuries, manned and artificially intelligent exploratory missions will be sent elsewhere in the solar system, and that AI probes will be moving well beyond the confines of our Sun. In what is still one of the most important volumes on space exploration and settlement from a human perspective, Ben Finney and Eric Jones stated that:

> [T]he use of technology to expand beyond Earth would be entirely consonant with the whole trend of human evolution. From the time the most adventuresome of apes left the tropical forest to seek a living in the grasslands of the African savannah, our ancestors have been inventing technology to adapt to new environments and to expand over the globe. There is a large techno-cultural distance between grubbing succulent roots from the soil of the savannah with digging sticks on the one hand and growing algae to provide both food and oxygen for Moon colonies on the other. And it is a long way from sailing canoes to interstellar arks. But ever since our ancestors started using tools to survive and eventually flourish in new environments, the pattern of evolution by cultural as well as biological

> adaptation has been underway. Although the prospect of travelling and living in space might seem 'unnatural' to many, it would represent a logical extension to the technological path our ancestors have been following for some 5 million years.
>
> (Finney and Jones 1985: 335)

They continue:

> If our descendants spread far and wide through space, the forces of evolution now braked on Earth will be released once more.' 'Human evolution in space will hardly be limited to the birth of one new species. Space is not a single environment…. There are innumerable environments out there providing countless niches to exploit, first by humans and then by the multitudinous descendant species. By expanding through space we will be embarking on an adventure that will spread an explosive speciation of intelligent life as far as technology or limits placed by competing life forms originating elsewhere will allow.
>
> (1985: 335)

The point here is that our movement into space is yet another giant step towards artificiality. Clearly it will be necessary for humans to develop completely self-contained biospheres in which they can safely live in outer space. Oxygen, water, food, perhaps gravity, protection from cosmic rays and solar flares – everything that we take so much for granted on Earth – will have to be brought to space, or created there, artificially, by humans.

At first, humans in space will probably try to make space as Earth-like as possible, but it is highly likely that Earth-kind in space will eventually become Space-kind – no longer defining everything, or even anything, by 'what it was like back home on Earth'. Thus, as Ben Finney says, evolutionary processes long pent up on Earth will be unleashed in space, and the most dramatic explosion of speciation the universe has (apparently) ever seen will occur. This will be aided greatly by advances in biological and molecular engineering so that myriad new intelligent life forms will arise or be created as life moves from Earth to the solar system and beyond.

I consider one of the most important reasons for space exploration is to provide humanity with the experience it needs to create a viable artificial biosphere here on Earth. Of course, I suspect that, ultimately, intelligent life – artificial life – will shed its earthly biological container and the biosphere in which it was nurtured and seek other, perhaps silicon, forms. But, for the foreseeable future, we desperately need a biosphere that works, given what we have done, and continue to do, to the only one we know works, Earth. It will require a lot of human ingenuity to create and maintain a new one, so our experiences in creating biospheres for space will be very valuable to anyone engaged in a similar enterprise on Earth.

Directing tsunamis: 'law-making' and 'governance' in a chaotic world

While every culture in the past has unconsciously invented the world in which it lived, consciously inventing the world is a special characteristic of modernity. One clear example, among many, was what the Founding Fathers of the USA did, first in writing their 'Declaration of Independence' so that the entire world would understand the reason for their actions, and then establishing a written 'Constitution of the United States of America', so that posterity would be guided by their 'constituting' words and deeds.

These two profoundly influential documents were also accompanied by a change in the way 'legislators' came to view themselves. Once upon a time, established 'men of reason' would come together on occasion to 'discover' the law that lay apparent to them in nature (and/or God). But by the end of the eighteenth century, legislators were also viewing themselves as 'law makers' and not as mere 'law discoverers' – they came to believe that they could improve on nature's laws by using nature's principles (to be sure) to write laws of their own for the benefit of humanity (Wheeler 1974).

'Law-making' has by now become so characteristic of legislatures – and often judiciaries, in the US system (Dator 2001) – that we think nothing of it. However, the early pretence was that once the legislators had made a new law, the problem was fixed and there was no longer any need for more legislation in the area. That is one reason why legislative assemblies originally met (many still do) for only a few months in the winter (while the crops were in and there was little work to do on the farm). But gradually legislators enacted more and more laws, and the creation, modification, interpretation and administration of law became a full-time occupation for an ever-growing number of people.

This led Donald Campbell some time ago to suggest that, since legislation never finally 'solves' any problems, legislators should view themselves as experimenters, and their laws as social experiments. Let us enact a law and see how it works, modifying it as we go along based on what we learn from its operation. This could become social engineering on a vast scale, so vast that even Donald Campbell retreated from his position, recognising how terribly intrusive it would be to have so many experimenters measuring and monitoring the effects of their experiments on all the citizens of the country (Campbell and Russo 1999). Nonetheless, governments are engaged in social engineering, more or less consciously and more or less intrusively. And even if libertarians continue to have their way, and governments diminish to basically nothing, other social forces – probably economic – will then move in to fill the political vacuum. So we live in somebody's or some group's social experiment (currently we live under the myth of the 'magic of the marketplace') whether we like it (or know it) or not.

Reasons for future hope

I have already expressed my profound pessimism about the future of Earth, and humanity. Nonetheless there are several factors that suggest the possibility of a

global attitudinal and behavioural shift towards humanity's assuming responsibility for our 'rose'. These include the following:

> Better computer models with more 'lifelike' display capabilities may be able to forecast and display impacts vividly at the level of an electoral district or other unit of personal and immediate concern (see Houghton *et al.* 2001).
>
> 'Sustainability science' may mature, precipitating the next paradigm shift in the global scientific/research community beyond the Copernican/Newtonian empirical 'objective' science that still dominates now, towards interactive, ethically guided educational and research agendas. For example, Kates *et al.* (2001: 641) have argued that 'A new field of sustainability science is emerging that seeks to understand the fundamental character of interaction between nature and society. … The sustainability science that is necessary to address these questions differs to a considerable degree in structure, methods, and content from science as we know it'. Earlier, the 'Declaration on Science and the Use of Scientific Knowledge' adopted by the UNESCO World Conference on Science for the twenty-first century, meeting in Budapest in June 1999, said in part: 'The sciences should be at the service of humanity as a whole and should contribute to providing everyone with a deeper understanding of nature and society, a better quality of life, and a resourceful and healthy environment for present and future generations' (see also Collins 2001; Mueller 2003; Harremoes *et al.* 2002).
>
> Age-cohort changes. New cohorts may understand, accept and act on a future generations ethic as older, resisting, cohorts move out of power and influence. One of the most popular and provocative examples of age-cohort analysis can be found in a series of books written by William Strauss and Neil Howe (1995, 1997, 2000).

Several rapid and extensive developments in futures studies and in future generations studies also offer hope. These developments include:

1 From its origins as a major phenomenon in the late 1960s and early 1970s, through using 'the future' to help transform political systems during the 1980s (with the emergence and often fading of national futures commissions), through its establishment in some academic institutions throughout the world, and especially its expanding utility in more consulting services, futures studies continues to grow and mature even though it is still absent from most academic or consulting work in the USA (Bell 1997; Dator 2002).
2 A global ethic towards future generations is emerging. That the present generation has ethical obligations towards future generations is only slowly beginning to be understood. It is a concept absent from traditional ethical or moral discourse since, until relatively recently, there was little present generations could do to make the lives of future generations significantly better or worse than their own by their actions or inactions. Although contemporary

economic theory and practice severely discounts the future (Goulder and Stavins 2002; Brennan 1995; Broome 1994; Lowe 1989; Linstone 1973), more people are understanding that the situation now is different from the past, and that, when making decisions, present generations need to anticipate the impact their decisions may have on future generations, as well as upon themselves. Operating initially independently of each other, two groups, one in Malta and the other in Kyoto, organised to create an awareness of the need to create ethical concepts and social structures that identify the needs of future generations and have them active in contemporary decision-making (Partridge 1981; Busuttil *et al.* 1990; Institute for the Integrated Study of Future Generations 1994a, 1994b; Kim and Dator 1994, 1999). These ideas and activities are bearing fruit. People professing to represent the interests of future generations were first acknowledged to have a legal standing by the Supreme Court of the Philippines in *Oposa* v *Factoran Jr* (1993). On 12 November 1997, UNESCO adopted a 'Declaration on the Responsibilities of Present Generations towards Future Generations', helping the discussion to spread worldwide.

3 Beyond provoking more widespread awareness of the ethical responsibility of present generations is the need to create social institutions that make carrying out that responsibility easy, and mandatory. Several recent initiatives have attempted to conceptualise, invent and create such institutions. For example, *Co-creating a Public Philosophy for Future Generations* (Kim and Dator 1999) was based on a conference of futurists and politicians who had experience in helping existing systems of governance around the world to embrace future-oriented institutions. Others have also presented examples of designs for political institutions and processes that are oriented towards identifying and fulfilling obligations towards future generations (Institute for the Integrated Study of Future Generations1994a; Kim and Dator 1994; Tonn 1991; Pollard and Tonn 1998).

I want to emphasise the necessity of creating institutions to support ethical (or political) policies. There are numerous popular ideas and scientific theories about why people behave as they do, and especially how to get them to behave 'properly'. Most of the differences come down to two perspectives. On the one hand are ways to change people's 'minds' and 'wills' so that they will want to do good and so will behave as they should by their own free will. On the other hand are ways to construct environments that necessitate people behaving properly, regardless of whether they want to or not. A variant of this is constructing environments that allow people to behave as they wish, but buffers the undesired consequences of their behaviour (Platt 1973, 1966; 108–131; Studer 1971).

Most reformers seem to focus on changing people's minds and wills in order to change their behaviour. While we know from the success of modern advertising that there is much power in this approach, we also know from our numerous educational, religious and even legal failures that it has severe limitations as well. It is often hard to change people's minds about certain things that

seem biologically, or at least culturally, deeply rooted. But equally importantly (although this is often overlooked) is the fact that even if people want to 'do good' they find themselves in structures that make it very difficult for them actually to do good. Thus, I have concluded that while sincere efforts should be made to change people's minds about 'assuming responsibility for their rose' so that people will understand and support extraordinary efforts at planetary management, it is equally, if not more, important that institutions be created that make such behaviour easy, and perhaps necessary per se, and do not rely upon moral persuasion and/or laws and enforcement.

For example, I have been convinced that recycling paper, glass and aluminium cans is good. I very much want to do that. But I happen to live in a community that not only does not even require recycling by law, but also actually makes it extremely difficult for me to recycle things. On my own volition, I must collect and clean the items, package them appropriately and then transport them many kilometres to some distant place I would not otherwise go for further processing. Indeed, the powers that be in my community argue that because of our small size and remote location, it is more economical for us to continue to waste than to recycle. So I am made to feel a fool (if not in fact a net energy-waster) if I recycle on my own.

This is a clear example of how the structures of the society in which I live shape and override my deep desire to do what I believe to be overwhelmingly good for the environment. There are many others examples such as speeding. Of course, there are laws against speeding in my community. But they are so rarely and arbitrarily enforced that one feels a sense of moral outrage when one is stopped for speeding, much less is fined for it – 'You should have seen me last night, when it was raining, and I was drunk and speeding much faster than now! Why didn't you stop me then? This time I am sober, the street is dry and clear, and I was barely exceeding the limit, going down hill! And why didn't you stop any of the people who were going much faster than I was, speeding past me? If I was going any slower, I would have been run over from the rear!' Laws, infrequently and arbitrarily enforced, create anomie and actually encourage outlaws while effectively penalising law-abiders.

So what should we do? In the USA, MADD (Mothers against Drunk Driving) some years ago launched a very widespread and largely successful campaign against drunk driving. It is no longer acceptable (indeed, rather 'manly') to drive while drunk, as it once was. Although this may encourage certain people to rebel against MADD simply because drunk driving has become a moral and not merely a legal issue, in fact drunk driving is down somewhat, while speeding with children in the car or where children are known to congregate is much less likely now than before because of a shift in the public's ethical position and behaviour. So moral suasion helps. But what really cuts down speeding are speed bumps in the road and 'roundabouts'. Both require people to drive more slowly than they would otherwise – or than they want to. And that is the point – devise structures that require people to behave as they 'should' regardless of how they want to behave.

Here is another 'silly' example. Some manufacturing processes require clean water and the discharge of polluted water. While there could and probably should be laws that prohibit pollution, and fines for violating them, a simpler solution would be to require all people to intake water downstream of their operations and to discharge it upstream. They are much less likely to discharge polluted water if they know they must intake it themselves.

What about real political behaviour? There are many examples of how political structures create political behaviour. The best-known and most widely understood 'law' in political science is that single-member districts (as in the USA) create two-party systems, while multi-member districts (found in most of the world) enable multi-party systems. It is simply not possible for a multi-party system to come into existence in the USA. The single-member district system prevents it. No matter how many minds or wills change, neither a third nor a fourth party can ever gain power in the USA. When a third does arise, it is either rejected or its position (and members) absorbed by one of the other two major parties (or it replaces one of the two major parties). It is entirely a question of structure. Indeed, the entire US Constitution is the world's first, and best, example of conscious political design to solve certain 'design limitations':

> *The 'separation of power' with 'checks and balances'*. The creation of three 'independent' yet overlapping branches of government so that selfish 'power will balance power', thus creating social good.
>
> *The 'division of power' and 'federalism'*. Enables 'sovereign' nations to join into a closer political union by 'dividing' power between them.
>
> *Bicameralism*. Secures the acceptance of the federal union from the states with small populations as well as the states with large populations by creating a Congress of two 'houses', one in which the states have equal representation regardless of their population and another where the states are represented roughly according to their population size.
>
> *Presidential electors*. Since the colonies forming the union had no history of political unity, and there were no means for creating a national political dialogue at that time – and no great faith in 'the people' anyway – how could the people in the widely separated new states possibly know who was nationally the 'best man' for President? The 'Founders' reckoned they could not, but that they would know their local 'best men', so they would choose them and they would go to Washington to choose, after discussion, the national 'best man' for President.
>
> *Presidentialism*. The creation of the presidentialist system itself has behavioural consequences that even most Americans – even most American political scientists – do not recognise. Fred Riggs has presented convincing evidence that, compared to parliamentary forms, presidentialist systems are much more likely to disintegrate into military dictatorships. Except for the USA itself, all of the thirty countries that had adopted the presidentialist

> system as of 1985 when Riggs carried out his survey turned into military dictatorships, while 'only' a third of the forty-three that adopted the parliamentary system did so. After the collapse of socialist systems, the fact that countries such as Russia and many eastern European nations adopted the presidentialist rather than parliamentary system may have grave consequences in the future (Riggs 1992).

Why the difference? Because, Riggs shows, the built-in structural equality and conflict of the presidentialist system leads to inevitable political stalemate that is eventually broken only by a military coup, supported by the civil servants. Riggs also shows how certain features of the US system (unrelated to the formal constitution, but nonetheless structural, and never exported to other systems) have so far prevented the logic of the presidentialist system from turning the USA into a military dictatorship, although post 9/11 developments are certainly making that possibility more likely than ever before.

To conclude, while will matters, structure matters even more. If we want people to 'assume responsibility for their rose' we not only must convince them to do so, but we must imagine and create institutions that make it easier for them to assume, rather than to avoid, that opportunity (Miles *et al.* 2002). The first step in reconceptualising environmental values in the globalising world is thus to recognise that we have perpetual responsibility for our 'rose', Earth. A second step is to develop an ethical perspective that furthers our acceptance of that responsibility. A third step is then to recognise that institutions need to be envisioned and created that make it easier to accept the responsibility than to reject it. And the fourth and most important step of all is that we then need to do the hard but necessary task of envisioning, creating and testing out those institutions. As I have shown above, we are not alone in this work, several conferences have already been held that have resulted in proposals for institutions which make it easier for present generations to balance their needs against those of future generations. All that is needed is for more peoples around the world to join together in this novel but vital quest.

Notes

1 See also Ausubel (1997), Budiansky (1995), Palumbi (2001a, 2001b), Cronon (1995), Goodman and Redclift (1991), McMichael (2001), Alley *et al.* (2003) and Tonn (2002).
2 See online games: www.thesimsonline.com; everquest.station.sony.com; www.gamneverending.com for virtual reality.
3 See *Journal of Futures Studies* (2001, issue 6) on the evolution of 'artilects' and their legal rights. See also http://www.kurzweilai.net/, http://www.media.mit.edu/~neilg/, http://www.frc.ri.cmu.edu/~hpm/, http://www.bt.com/sphere/insights/pearson/human_evolution.htm.

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