

SURFING THE TSUNAMIS OF CHANGE

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Tsunamis, sometimes mistakenly called "tidal waves," are impressively big acts of nature, made bigger and more impressive, perhaps, by acts of humans which modify weather and climate, and which erect structures which may, or may not, be appropriate for the approaching tsunamis. Perhaps because I live on an island whose past has been, and future will be, shaped by tsunamis, I see the future as approaching us in the form of huge tsunamis for which we are wholly unprepared as a society, and largely unprepared individually. But as you know, surfing is a very popular sport in Hawaii, and thus I urge that we emulate the ways of a surfer: That first we first study, and then we learn to surf, those waves to the best of our ability. I intend just to touch on but seven of the major tsunamis I see racing towards us from the future, and asks you to think about their potential consequences for the future of Mexico.

The tsunamis I will consider are, in order, demographic, environmental, technological, economic, political, cultural and global [Similarly, Kennedy].

The first set of tsunamis is demographic--changes in the number and mix of people in the world, and every part of it. Like all the other sets, this is composed of highly complex and dynamically interrelated waves, but let me give you a few of the most interesting figures, and some of the more compelling consequences which I think derive from them.

The population of the world continues to grow at a rapid and dangerous rate. While some people may try to tell you that global population is beginning to decline, I believe, to the contrary, that almost all of the most "alarming" and "radical" forecasts of global population of the past and present have proven in fact to be too cautious and conservative.

For example, some of you may remember that in 1960 a widely-ridiculed article by Heinz von Foerster in the magazine Science predicted that, if population trends of the time continue, every square inch of the world will be covered with humanity, and humans will then begin spreading exponentially into space, by Friday, November 13, 2026.

Everyone laughed of course. That was a mere mathematical extrapolation. It would never happen. It **could** never happen.

And indeed, a recent re-examination of that forecast by my friend Stuart Umpleby, titled "World Population: Still Ahead of Schedule," and published in the same journal, Science, of September 25, 1987, shows that the 1960 forecast was in fact wrong. In forecasting global population between 1960 and 2026, von Foerster's equation significantly **underestimated** the actual global population between 1960 and the mid 1980s. That is to say, actual population growth between 1960 and 1985 was in fact substantially higher than von Foerster forecast it would be in 1960. Thus, the doomsday it forecast will come well before 2026, if trends continue. And policies pursued by most governments over the last decade have had the consequence of **increasing** the rates of global population growth, not decreasing them.

For example, the Vanderbilt University demographer, Virginia Abernethy, last year stated the following:

"Since the 1930s, many experts have said that modernization and lower infant mortality would produce fertility *declines* in the third world, accomplishing a 'demographic transition.'" "The idea that socioeconomic development is the way to control worldwide population growth is appealing and continues to hold sway.

"It is my conclusion that the demographic transition model is wrong. Attempts to implement it usually harm the very countries one tries to help. Most efforts are flawed because they signal, intentionally or not, the comforting but tragically misleading message that no real environmental constraints exist.

"Families which expect a trend of expanding opportunity have *more* babies, not fewer. So any policy which conveys a message that we live in a world of abundant resources and few constraints has blundered--and blundered badly." [Abernethy, p. xiv. Italics in original]

While, as I will suggest later, it is possible that technology will ride boldly to the rescue once again, and, as it has so often in the past, permit substantially more humans to live more or less comfortably on a substantially more crowded earth than they do now, that is too slim a reed to place much hope upon in my judgment. Countless highly reliable commentators have pointed out that humanity as a whole is already living beyond the limits of sustainability, and that the rushing tsunami of ever-more human beings crowding onto the planet guarantees catastrophe for all our children and grandchildren, and perhaps for all life.

However, what is true for the world as a whole--massive population growth--is not true for some parts of it. The populations of many European nations (especially the former state-socialist parts) are either stabilizing or actually declining in numbers--some dangerously so. The same is true for North America and Japan. So that means that certain parts of the world, what we used to call the Third World, are growing even faster than is the world as a whole.

And what might be the consequence of that? One suggestion has been offered by Prof. Mahdi Elmandjra of Morocco, who is participating in this conference

with us today. Prof. Elmandjra was President of the World Futures Studies Federation, as well as President of Futuribles, the major francophone futures organization headquartered in Paris. He observes that one hundred years ago, the population of the world was roughly equally divided between white and nonwhite peoples (whatever those terms might mean!). At present, the white population is roughly 20% of the global population, the nonwhite portion is 80%. If trends continue, Elmandjra concludes, the white population of the world, by the mid 21st Century, will be around 1% to 5% of the world population.

My friends from one of the Pacific islands in Micronesia say the future might well be called, "The New Bronze Age."

Good-bye whitey! It was nice to know ye! Anybody want to hold a walk for white people? Take a white person home for Christmas? Start a fund to preserve the late, great white race? My advice to people in North America and Europe is: if you are white, do your children a favor and miscegenate. As you may know, that is our general practice in Hawaii. And it is not unknown as a positive thing in this part of the world either.

There are many implications of this probable demographic shift. First of all, the currently-dominant industrialized nations are faced with a demographic future which is in many ways the opposite of what it is for the world as a whole. Since the "advanced" nations tend to assume that they are the world, they will focus more on their very atypical problems, and, not feeling directly what the rest of the world feels, will not respond anticipatorily or wholeheartedly to global demographic problems as they should.

Also, to the extent that much of traditional 20th Century economic growth has been driven--or led--by sheer population growth, most industrial nations face a set of demographic problems wholly unique to them--which their traditional economic and political theories and policies cannot handle. This will encourage the industrial nations to focus even more tightly on their own atypical demographic problems, and ignore those of the rest of the world.

But what about the future of Western Civilization? How will it--why should it--survive (much less dominate) if the peoples who created it are such a tiny fraction of the future? The reason for the present dominance of Western ideas in the world is in part a consequence, not just of their arguable nobility and superiority, nor even because Western ideas followed Western military, economic, religious, and commercial imperialism. It was in part because there were, comparatively, so many Westerners on the globe to spread their culture around.

No more. Thus, (and to my mind, this is probably the most important single thing to know about the demographic tsunami) to the extent your ideas about the future of Mexico and its place in the world derive from the myths and fears of Western Culture, your ideas about the future may be imperiled by these demographic changes, while new ideas and projects based on the worldviews of different cultures, may leap forward. Why not contribute to that leap instead of focusing on the ideas of the past?

In which case, I hope the worldviews of new and different cultures are more creative and adaptive than any I have encountered so far. The demographically-driven challenges of the future are absolutely without precedence.

For example, a report by the United Nations University recently pointed out that "at the dawn of the 20th Century, the world was largely a rural place--fewer than one person in seven lived in an urban area. By the end of this century, we face a global population that is half urban. By far, most of this growth will occur in the largely overcrowded and unmanageable cities in the third world, particularly in those huge urban conglomerations known as 'mega-cities'" "At the beginning of the 19th century, the largest city in the Western world was London with just under a million people, whereas in Asia, Tokyo had just over one million...." "A hundred years later, at the onset of the current century, there were 11 cities worldwide with more than a million inhabitants--most of them in Europe and North America. By the year 2000, it is estimated that there will be a total of 24 cities around the globe with populations in excess of 10 million. Eighteen of these mega-cities will be in the third world." (UNU Work in Progress, September 1991, p. 1). It certainly is no news to you that Mexico City, with a projected population of more than 26 million people by the year 2000, is expected to be the world's largest city. By comparison, the population of all of Canada now is about 26 million.

In addition, this human movement towards mega-cities with their mega-challenges and mega-opportunities is continuing unabated. While world urban population rose from 34% in 1960 to 40% in 1980, it is expected to rise to 48% in 2000 and 62% in 2025--if von Forester's equation doesn't prevail instead! "Cities in the Third World are growing at 3-4% per year, but shanty towns, illegal subdivisions, and low income neighborhoods are growing at twice that rate. This means that any innovative solutions for livable, sustainable cities must deal with the issues of massive urban poverty." [Michael Marien, abstracting Janice Perlman, "Megacities and Innovative Technologies," Cities, May 1987, in Future Survey Annual 1987, p. 129]

While there is much more to be said about the impact of the tsunami of population growth and distribution, there really is no need to say it to any audience of Mexican futurists, who must personally know more about this matter than anyone else on earth. At least, I hope you do.

The **second tsunami** is closely related to the first, and it is that set of **environmental** factors often called "global change." There is much more uncertainty about this tsunami than about the first. Of course, even demographics is uncertain. While destabilizingly-rapid global population growth seems to be part of the most probable future for this planet, it is always possible that AIDS [Mann], or new viruses [Fisher, Morse], or global biological warfare or the like will instead so seriously deplete humanity that the real demographic challenge of the 21st century will be repopulation, not overpopulation.

Possible, but I doubt it.

And, in any event, not a preferable future; not the best way to deal with rapid population growth. The best way, in my judgment, is to assume that global

overpopulation on the one hand and a global shift in demographic/cultural proportions on the other will occur, and to plan for them.

Similarly, there is much uncertainty about our environmental future. But I believe it is prudent to begin to face--and act towards--the future with these probabilities in mind.

Since 1984, the Worldwatch Institute in Washington, DC, has published an annual authoritative summary of global (primarily) environmental concerns and activities called State of the World 19XX. It is the most useful single annual compendium of environmental monitoring I know of. However, in 1992, the Institute began publishing an even more useful annual capsule of the present and future quality of life on the planet titled, Vital Signs 19XX: The Trends that are Shaping our Future. Vital Signs 1992 was also published in Chinese, French, German, Italian, Japanese, and Spanish. It is also available in computer disk. I am sure you are all familiar with it in some form or language.

The most recent edition of this latter publication available to me as I write this paper is Vital Signs 1993. Lester Brown, the President of the Institute, wrote an opening chapter, "An Age of Discontinuity," which summarized the trends discussed in the volume as a whole. It opens with this statement:

"When the history of the late twentieth century is written, the nineties may well be seen as a decade of massive discontinuity. Long-established global trends that had been rising for decades...are now falling. Others that were going nowhere, or at best rising slowly, are suddenly soaring...."

"A survey of the 42 global indicators compiled for this year's Vital Signs shows four new challenges facing policymakers: First, it is becoming more difficult to expand the output of basic foodstuffs, such as grain, seafood, and livestock products, as fast as population. Second, the global economy is not expanding as easily as it once did. Third, we appear to be on the edge of a basic restructuring of the world energy economy. And fourth, the prospect that continuing rapid population growth could undermine living standards is becoming a reality.

"In the production of food, neither the world's farmers nor its fishing fleets are keeping pace with the growth in human numbers. Grain output per person has fallen 8 percent from the historical high reached in 1984, dropping roughly 1 percent a year. There are no new technologies in prospect suggesting that farmers can restore the 3 percent annual rate of growth in the world grain harvest that prevailed from 1950 through 1984, helping reduce hunger and malnutrition.

"Expanding the world fish catch is even more difficult. The oceans may not be able to sustain a catch of more than 100 million tons, the level reached in 1989." [Brown, Vital Signs, p. 15f]. Particularly disturbing was near-catastrophic losses of marine mammals, such as whales, dolphins, seals, manatees. While some of this is the direct consequence of human predation, much of it is the indirect consequence of ocean pollution and ozone depletion. "Future trends among marine mammals may be a telling measure of stability in human society itself." [Brown, Vital Signs, p. 111. See also Janet Raloff, "Something's Fishy," Science News, July 2, 1994, p 8f)

In addition, deforestation, air pollution, desertification and rapidly eroding topsoil, freshwater scarcity and pollution continue to rise alarmingly. Concerning freshwater, the report said that

Today, 26 countries, collectively home to some 230 million people, fall into the water-scarce category. Many of them have very high population growth rates, so their water problems are deepening fast." "Some of the most worrisome cases of unsustainable groundwater use involve 'fossil' aquifers, underground reservoirs that hold water hundreds of thousands of years old, and that receive little replenishment from rainfall today." "Shrinking groundwater reserves, falling water tables, increased flooding and droughts, and water budgets that are badly out of balance are tangible indications of unsustainable water use--a situation that, by definition, cannot continue indefinitely." [Brown, Vital Signs, p. 106f]

Global warming, and eventual damaging sustained sea level rise, remain a major concern. "Although not as warm as some recent years, 1992 was still well above the average for the years 1951-80, the period used by meteorologists as a reference period."

"Although the precise effect on temperature of rising amounts of greenhouse gases is debatable, measuring the rising concentrations of greenhouse gases in the atmosphere is extraordinarily precise" and good reason for urgent concern and action.

"World agriculture, which has evolved over the last 10,000 years during a period of remarkable climate stability, would be directly affected. Any major climate shift would be extraordinarily disruptive."

Moreover, "the projected rise in global average temperature is expected to cause a rise in sea level of 18 centimeters by 2030, and 44 centimeters by 2070 due to both thermal expansion of the oceans and the melting of mountain glaciers. Such a development offers a specter of vast displacements of people." [Brown, Vital Signs, p. 68. See also Schneider]

The movement of millions of angry global environmental refugees, the loss of countless hectares of the best agricultural land, and the destruction of most traditional agricultural habitats must be anticipated worldwide during the 21st century--and yet food production globally is already decreasing, and population increasing precipitously [Sachs].

The Australian National Commission for the Future several years ago conducted a nationwide campaign on the greenhouse effect. As part of that campaign, they printed and distributed a poster that had the famous billowing "sails" of the Sydney Opera House nearly underwater, as global warming melted ice caps and raised sea levels dramatically. The caption for that poster read:

"If we act as though it matters and it doesn't matter, then it doesn't matter. But if we act as though it doesn't matter and it matters, then it matters."

I would agree with this entirely. I think the stakes are high enough, and the uncertainty great enough, that we all ought to "act as if it matters." I

especially bitterly resent the foot-dragging which has been characteristic of all nations on this matter, but has been the hallmark--almost the pride--of US policy. The United States has the obligation, I believe, to be the world leader in assessing and proactively anticipating all aspects of global change, since it has contributed so much to the processes which may result in global change, and has profited even more from them. If it turns out the worst fears--or even the minor fears--about global change were wrong, then, "no matter." But if it turns out that the worst fears, or even some of the minor ones, were correct (as I suspect), then we might have acted usefully, as well as responsibly, towards future generations--as we should, but (especially over the last one hundred years), as we almost never have. [See also, Burrows, Coleman, Hawkin, Heilbroner]

Now, from my point of view, the underlying cause of the two tsunamis mentioned so far--indeed also of all those which will be discussed later--is found in the **third set of tsunamis: technology**. I believe that new technologies historically have been the major agents of social and environmental change. And I believe the technologies of the present and immediate future--I'm thinking here of electronic information and telecommunication technologies--have already marginalized and bypassed, if not utterly destroyed, all major institutions of the present--including many of the reasons cities--and megacities--came into existence to begin with. But when I look at what the completing of the human genome project, and all the other aspects of the biological and nanotechnological revolution are about to do to our ideas about and fund of "information," "intelligence," and even "life," then I realize that the impact of electronic technologies on our old institutions and beliefs is nothing compared to what these new technologies are about to bring.

One major reason we have a looming global population crisis is because of 19th and 20th Century technologies which made it possible for so many pregnancies which might otherwise have miscarried, to reach full term; so many infants (and mothers) who might otherwise have died during or shortly after childbirth, to survive; so many children who might otherwise have died of various accidents and "children's diseases" to reach puberty and quickly produce so many surviving children of their own; and, as Virginia Abernethy has already said, so many men and women who might otherwise have used traditional ways of birth control to limit their family size chose to use none and have as many children as possible precisely because the dream of "development" encouraged them to do so, since continuous economic growth, progress, and endless wealth now was said to be obtainable for every human being on the earth--the root cause of all of this lies in certain technologies (greater sanitation and other public health measures, some of the original "miracle" drugs, and to a far lesser extent, modern medical and hospital practices) and the concomitant belief in continued progress, growth, and technological improvement which became the orthodox ideology of "development" that is the distinguishing mark all industrial and industrializing societies everywhere.

Similarly it was the technologies of industrialization that felled the trees, destroyed the topsoil, raped the earth, consumed or poisoned the water, polluted the air, destroyed the ozone, and in general and everywhere, paved

paradise and put up a parking lot. It was, in short, industrial technologies which were, and are, the agents of "global change."

Many futurists are content to stop here--at a backward, accusatory stare and condemnation of all of the bad old technologies which have brought us to our fetid present and are propelling us into a thoroughly unsustainable future.

Maybe that is enough. Maybe those technologies--in most ways still dominant around us--are enough to help us understand what is important about what lies ahead.

But I don't think so. I believe certain still-developing technologies of the present, and emerging technologies of the near future--and beyond--are infinitely more powerful (more truly transformative) than anything humans have ever experienced before which many people feel has already been quite enough.

Indeed, so saying, it is essential that I point out that I do not believe there is anything particularly new in all of this technologically-induced change. To the contrary, one of the most--if not actually the most--characteristically distinguishing mark of humans--the thing that makes us so different, so dangerous, or at least so problematic a life form--is our willingness, from the very beginning, to use technologies to bend nature to human purposes--and in the meantime, to interfere with natural process we may be able to use, but do not adequately understand.

The only important difference between humans now and at any time in the past is not that we use technologies now, but did not use them previously. No. It is that our current technologies are orders of magnitude more powerful and global than any previous ones--and that emerging technologies will be even more powerful and, well, (clearly beyond merely "global") cosmic.

One of the most alluring bits of nonsense, found in every part of the world now, is that once upon a time, noble savages lived in purposeful harmony with their environment. To the extent early humans lived in harmony with their environment at all it was because they did not have the tools that would permit them to do anything else. To the extent they did have tools that permitted them to modify--destroy or foul--their environment, more often than not, they did so.

As critical as I am of the unwillingness of our present economic and political "leaders" to face the increasingly obvious environmental tsunami racing towards us, I categorically deny that there are cultures and groups that, given the chance, would have done it otherwise.

Genocide--the extermination of one cultural and/or ethnic group by another--is historically pervasive where it was technologically possible, and always morally reprehensible. If certain ethnic groups now can successfully invent a mythic past of moral purity and ecological sustainability to help them get back at ethnic or cultural groups which oppressed or tried to exterminate them in the past, well and good--as a political tactic. But, for the most part, it is only a potent political weapon and not an historical truth.

Marshall McLuhan's famous statement--"We shape our tools, and thereafter our tools shape us"--is accurate for all of human history, and prehistory.

It is also true for the future. So what new, emerging, or developing technologies lie ahead, and how might they impact society?

A few years ago, before Vice President Gore articulated the now well-known concept of an "Information Highway," I was asked to talk about future transportation needs and technologies for my home town, Honolulu, Hawaii. I titled my little talk, "Commuting at the speed of light." I opened by reminding the audience that anybody who lived in Hawaii in 1973, and either had to drive a car or drive in a car, would certainly have vivid memories of the so-called "Arab Oil Crisis"--memories of the amount of time one had to spend planning to buy gas; the frustrations and indeed dangers of standing in line or trying to get in line to buy gas; the dramatic increase in the price of gas; and various attempts by government at all levels to do something about the situation.

One thing I vividly remember is that then-Governor George Ariyoshi issued a ban--or at least a plea against--all non-essential automobile travel. He said people should use their cars only to drive to work. All pleasure driving was to be discontinued.

I publicly went on record at the time in opposition to this decree. While I was not opposed to his issuing a statement against unnecessary automobile travel, I felt that the Governor had gotten it all wrong: if he wanted to make a contribution to solving Hawaii's transportation crisis then, he should have forbidden anyone from using their automobile to drive to work. He should have ordered the police to stop anyone driving and ask where they were going. If they said they were going to work, they should have been immediately arrested, and a search warrant sent out for their employer as well. All people going to work, and all people requiring other people to go to work, should have been immediately jailed.

On the other hand, people who said they were using their cars to go to the beach, or to visit their auntie, or who were just cruisin'--these people should have been honored on the evening TV news as citizens who understood that the proper use of automobiles is for fun and status--the only truly "necessary" travel. If you want a good place to make out, or to show off, or to go to the beach with your surfboard and a cooler full of beer, then you would be sent on your way, with honor. But if you believed it was, even in 1973, necessary to go to work, then you clearly deserved to be sent to a "correction facility."

Now, what was arguably true in 1973, before the invention and dissemination of personal computers, modems, cellular phones, fax machines, fiber optics, and all the rest most certainly is true now in 1994, and will be obvious to anyone who is not a traffic engineer, transportation consultant, or building contractor well before 2003.

So, please, please, I beg you: do NOT do anything any more to encourage people to go to work, whether it be by car, bus, subway, elevated tram, maglev, ferry, autogiro, or even bicycle. It is neither necessary nor desirable. A decade and a half of experiments with telecommuting have made it clear that telework works; that all of the money intended for mass transit and downtown urban

renewal can much better be spent by providing free to everyone the hardware, software, and orgware they need to do their work at home, or at least within walking distance of their home.

As even President George Bush said, in March 1990 while introducing the Statement on National Transportation Policy, quote: "Sometimes the best policy means not moving people, but moving their work,...a trend known as telecommuting ... Think of it as commuting to work at the speed of light."

I live in a little electronic grass shack high above the steadily-rising seas in Waikiki, connected by my modem, phone, and fax not only to all of my students and colleagues at the University of Hawaii, but, when I was President of the World Futures Studies Federation, to Pentti Malaska and all of my colleagues in the Secretariat of the WFSF in Turku, and to many of the members of the Federation in more than 80 nations around the world.

For the past several years, I have required all of my university students, undergraduate as well as graduate, to obtain a computer account (they are free) and use a computer conference I have set up for them on the University mainframe to communicate with me--and each other--daily about their school work. All assignments are posted in the computer conference for each of the class members to read, and comment upon (and to read and comment on my comments of their school work). Groups projects are to be done online (though not necessarily in a "space" where all class members--or even myself--can see them). Since I must travel a lot--such as to this conference in Mexico City--I take my Macintosh PowerBook with me wherever I go and (when the local conditions make it possible), I keep in touch with my students--and everyone else online in the world--wherever in the world I--or they--might be.

Of course, once a student is online for my class, they are online for the global Internet, and they take advantage of it. Hawaii is the most geographically-remote place on the planet, but my students would never know it: from their home (or a university computer lab if they don't have their own PC/Mac), they have virtually instant access to every part of the world, and to a staggeringly-rapidly increasing number of people and volume of information everywhere.

Thus I very well know from personal experience, as well as from research and observation, that it is no longer necessary to move people to central locations to work (or study, or almost anything else). The work can go to and from them to every part of the world at the speed of light. So I urge decisionmakers please, do NOT construct more "centrally-located" business buildings. Do NOT continue to build new roadways and railways in order to handle "rush hour traffic." It is NOT necessary any more for everyone to travel back and forth at the same time in order to work together. Stay home to work, and only travel for fun (which does mean, please DO come to Hawaii and keep our tourist business alive).

I offer the same advice to any one who wants to construct a new school building or university campus. That was yesterday, when it was necessary for you to go to the people and places where knowledge was concentrated. Now the knowledge should come to you--when you want it, and in the forms you want it (and not the way some out-of-date professor organized it years ago for his convenience, when "knowledge was power").

Many people believe that only the presently rich countries (or some of the rich people in the poor, as well as rich, countries) of the world can possibly ride down the information highway successfully. It costs so much and requires so many other technical and support systems which poor people, and poor countries, do not have that it is irresponsible of me to speak positively about these information technologies at all.

I don't doubt that the powerful will use new technologies, as they use current and old technologies, to perpetuate, consolidate, and extend their power--if they are permitted to do so.

It is possible--not inevitable, and not even probable--that poorer countries and people might move into the electronic information era more easily than some rich people and countries. For example, the relationship between broadcast and cable technologies may be reversing. It used to be the situation that telephones were connected by cables and switches, and that television came over the airways. Thus, a current limitation to my using my Powerbook now is the existence of a good telephone outlet (and network) and electric power plug (and power supply). If I go to places which have poor, no, or certain types of regulated phone lines, I can't plug in to the Information Highway.

That may not be a limitation much longer (it actually need not be a limitation now, if I had the money). Phones, modems, and faxes will probably soon be delivered from any and everywhere to any and everywhere by global satellite systems. Land cables will be used for--well, something else. Thus, "poor" countries with no or little existing information infrastructure may be able to leap onto the information highway more efficiently and effectively than "rich" countries with scads of obsolete technology, software, and orgware.

All in all, I believe that the transforming power of the Internet, and all of its possible successor netwoven communication technologies, are in the process of completely destroying all of the institutions, behaviors, and values which arose around the industrial technologies of the 18th, 19th, and 20th centuries--economic, military, political, cultural--just as industrial technologies destroyed--or at least marginalized and changed--the institutions, behaviors, and values of pre-industrial, agricultural societies. [See Brand, Tehranian, Toffler]

But in many ways, I am only making a very shortrun observation here.

Far more transforming, in my view, is the imminent emergence of artificial intelligence on the one hand, and genetic and molecular engineering on the other.

As with my other tsunamis, there is great controversy surrounding first the existence, and then the probable impact of new technologies. The literature on whether, for example, the immanent completion of the human genome project is no big thing, or of godlike proportions is enormous, technical, emotional, mind-numbing. Many people argue that this is merely one more tiny step in a remote branch of science, which, like many Big Science Projects, is really of consequence only to a handful of nerdy biologists and computer scientists. Others say that (especially when linked to other converging technologies) the

completion of the human genome project will be the most revolutionary intellectual/technological step humans have ever made.

Similarly, among those who think that humans are on the verge of achieving truly godlike powers, there are unending arguments as to whether it is "good" or "bad" for humans to have these powers. Is it all over for humans, and all life, or "only" a transformation of life equivalent, for example, to the evolution of photosynthesis, or the first movement of some animals from water to the land--but occurring, this time, in a few decades?

Well, I take the "godlike" and "good" position in this controversy. I believe that developments in electronics, artificial intelligence, virtual reality, genetic engineering, and nanotechnology are truly revolutionary-evolutionary, portending the end of homosapiens in one form, and the potentiality of our emergence, during the 21st Century, into something totally different.

The Foresight Institute is devoted primarily to research and development of "nanotechnologies"--the engineering of machines which operate at the nano scale, at the size of atoms and molecules. Eric Drexler, the founder of the Foresight Institute, says that "Eons of evolution and millennia of history have prepared this challenge [of nanotechnology] and quietly presented it to our generation. The coming years will bring the greatest turning point in the history of life on Earth. To guide life and civilization through this transition is the great task of our time." [in his Engines of Creation. Anchor/Doubleday, 1986, p. 239]

I recently put the same point this way:

I view the past, present and certainly the future of humans as being very problematic. Humans are a very new entity on the face of the earth, and it is quite unclear whether we are the crown of creation poised now finally to leave our cradle and take our destined place among the billion suns and moons of space or if, instead we are a kind of cancer eating at the heart of Gaia, our mother, Earth.

Whatever ultimately be the truth, if truth there ultimately be, I want to believe that the evolution of homo sapiens is nothing more than the evolution of an "information society" that stretches back about 100,000 years ago up to the present. It has been said that humans are nature thinking back on herself. But, humans have not only some slight capacity to think, to plan, and to remember, they also try to carry out their plans via technologically-assisted actions. So humans are not only nature thinking back on herself, but nature acting more or less consciously on herself. And it is this combination of feeble thought and potent action that makes humans so dangerous, or at least so problematic.

As I have already quoted from Marshall McLuhan: "We shape our tools, and thereafter our tools shape us."

There is no doubt that one of the most powerful tools humans have invented and reinvented are those which have facilitated thought itself and the communication of ideas and feelings: the evolution first of speech, which may

have given homosapiens dominance over the other intelligent primates; then the very slow evolution of writing, which made it possible to colonize time as well as space. Then, only a short time ago in the span of human evolution, the creation of the printing press, largely responsible for the forces that lead to industrialism and modernity, and now electronic communications technologies and the "coming information society" of the old futurists.

But we ain't seen nothing yet. The next "information society" deals with something even more powerful and problematic: genetic information.

However, this too is nothing more than the latest hand-off in what has been a 4 billion year-old genetic relay race to the present. Indeed, this is the first and the most fundamental "information society" of all. Human biological evolution is simply the most recent part of an extremely long line of life--of the DNA that encodes the information necessary for the continuation of all life--which evolved as the first genes 4 billion years ago interacted with their environments in different ways, thus producing different species and forms of life, some few of which have persisted down to the present.

Of course all evolution is co-evolution, and some people are now saying that it is better to think of genes as "theories" or "hypotheses" that are expressed in response to environmental stimuli; that genes are not determinative forces but possibilities, tendencies--alternative futures--which become real only as they co-evolve with the real environments with which they interact.

Nonetheless for the first time humans may now stand on the threshold of something entirely new:

With the immanent completion of the Human Genome project, perhaps sometime during this decade, we may be able to understand, predict, prevent, and design genetic capabilities to such an extent that not only the future of human life, but the future of all life, is problematic. Of course, I would have to say the same thing even without the probable emergence of genetic engineering. Given the speed and magnitude of human-induced environmental change, the future of human lives, and all other life, is problematic as well.

So, clearly, the future of humans will not be like the past or present of humans. Almost none of the "information," "knowledge," or "wisdom" we have now, or have ever known, can adequately help us anticipate or understand what is to come in this respect--yet that is all we have available to us: old, probably useless, and maybe even harmful, information!

And of course, as the electronic revolution merges with the biological evolution, we will have--if we don't have it already--artificial intelligence, and artificial life, and will be struggling even more than now with issues such as the legal rights of robots, and whether you should allow your son to marry one, and who has custody of the offspring of such a union.

Thus during the 21st Century all historically-experienced human processes--agriculture, industry, commerce, education, you name it--will come to an end. If not in your lifetime, then certainly in that of your children and grandchildren, however they may be conceived, created, or decanted.

But what about culture, and the future of culture?

Culture is also a kind relay race through time. Cultures are also co-evolutionary. Cultures come into existence and change or persist in response to specific environmental situations. And different parts of a single culture respond differently to the environment thus giving rise to different cultures and subcultures. To this extent, cultural and genetic evolution seem to follow similar paths towards the present.

Yet from another point of view, what we seem to have in cultures is the opposite of what we have in living species. Until the emergence of humans, in any event, the march of natural evolution was towards more and more varied species and creatures. This appears never to have been the case with cultures. To the contrary, we do not find more and more human cultures evolving over time, but less and less. Don't archeology, anthropology and history show a cultural devolution from thousands of tribes tens of thousand years ago, to tens of civilizations three thousand years ago, to one grand, developed, industrial society that emerged 250 years ago?

Of course, at the same time, there does appear to be a diversification, almost a speciation, within human societies as they move forward from the relatively homogeneous roles within tribal cultures, to the few but marked social groups of feudalism, to the clear class lines of industrialism, and now to the specialization and overspecialization needed to deal with the infoglut of post-modernity.

What is actually happening, I believe, is the merger of four information societies into one--the 4 billion year-old genetic information society; the 10 thousand year-old cultural information society; the three thousand year-old civilizational society, and the 250 year-old industrial information society, all merging in the 21st Century into one new "coming information society."

Prof. Susantha Goonatilake uses the metaphor of "a-hand-in-a-glove" to describe the relationship of these four societies. For millennia, he says, genetics influenced culture, and culture influenced technology, although of course each shaped back on the other, as Marshall McLuhan's aphorism states. [Goonatilake. I am greatly indebted to the ideas which Prof. Goonatilake expressed in this paper for galvanizing mine into the form they take here. See also his "Biotechnology and information technology and the coming merger of science, technology and culture," prepared for Interface '92, and "The new technologies and the 'end of history,'" Futures research quarterly, Summer 1993.]

Also until recently it could be said that technology changed or adapted to changing environments the fastest. Cultures changed, though slowly, and often too slowly to cope with technological change. But human genetic change has been virtually nonexistent. All humans today are essentially the same genetically as they were when homosapiens sapiens first established itself tens of thousand years ago.

But now this long-established relationship between genes, cultures, and technologies itself is changing. Once genetic engineering becomes commonplace, genetic change will be as fast as any other kind of

technological change. Indeed, Prof. Goonatilake suggest, this development may be coming just in time: we may be able to use computer modeling to simulate and then to design and manufacture new life forms just in time to respond to changes caused by the Greenhouse Effect, something which Mother Nature, left to her own devices, could never do through the slow so-called "natural" processes of genetic evolution.

But what about culture? Can "culture" change quickly and appropriately enough to keep up with genetic and environmental change? It seems highly unlikely to me that existing human cultures can change quickly enough, and that is the root cause of my present ambiguity about the chaos and coherence of our exceedingly uncommon futures.

As Walter Truett Anderson and Maureen O' Hara have pointed out, while some of us live in post-modern cultures more or less appropriate for coping with the fast-moving environment, many more live in modern, and many more still live in traditional, cultures. Thus the probability that humans will find a viable path through the bifurcating present to a sustainable future in "the new information society" is very slight indeed. Violent culture conflict as the response to environmental and technological chaos seems the more probable outcome, with the extinction of all human life as a consequence.

With the evolution of artificial intelligence and artificial life, humans will no longer be the only part of nature thinking back, and acting back, on itself. Indeed, I believe that we humans emerged only to come to this point: humans are just the first hint--a tepid foretaste--of self-conscious nature. It has been our destiny, our duty, to produce more appropriately self-conscious entities, and through genetic and electronic evolution, we are beginning to do so. As Manuel Delanda said, we humans "might just be insects pollinating machines that do not happen to have their own reproductive organs right now." [In Mondo 2000, Issue 8, 1992, p. 47]

And then what? What will be the place of humans in such a future? Will we retire from the scene? Become pets for robots? Or zoom off into outer space were no humans have ever gone before, but certainly doing so in the company of robots, cyborgs and post-homosapiens? [The above was adapted from Dator, "Dogs don't bark at parked cars," Futures, January/February 1994. See also Anderson, 1990, Cooper, Crandall & Louis, Fox, Freedman, Glenn, Hammeroff, Heim, Herbert, Krummenacker & Lewis, Langton (2), Lee, Moravec, Stock, Yoxen, Zuboff]

After recounting "the tumultuous history of the search for Artificial Intelligence," Daniel Crevier ends with a chapter, "The silicon challengers in our future," (note that he does not even mention the biological challengers--much less the cyborganic ones--which I see racing at us from the future) with the following set of questions which are probably on the lips of every person who has ever been willing to take the possible emergence of these new entities seriously:

"If, indeed, early in the next century, machines just as clever as human beings appear, the question arises of how we will interact with them, and how they will affect our society. Perhaps the new machines will simply relieve us of tedious chores, expand our intelligence, and bring about universal peace and

prosperity. But will not the sight of a lifetime of human experience embodied into a few thousand dollars of electronics strike a fatal blow to our self-esteem? Will these machines not create a massive unemployment problem as they replace us first in factories, and then in business, science, and the professions? Even if we do find ways to redistribute the wealth generated by automated factories and businesses, what will be left for humankind to do? Having taken control of our lives through the economy, how do we know that machines will act in our best interests? [Crevier, p. 312]

In my opinion, seriously asking (though not necessarily believing it is possible yet to answer) these questions now should become a major activity of humanity--on a par with asking, and trying to answer, the questions presented by the tsunamis of population growth and environmental, global change.

All other questions--those which occupy most of our "serious" attention now, pale in comparison.

But let me discuss one or two of these less important, but nonetheless looming and challenging, tsunamis anyway:

Tsunami four: The Economy (stupid). In spite of occasional ups and downs, such as those we may now be experiencing, I expect the American, and to some extent the global, recession to continue, and probably to sink into an extended depression for the following reasons.

I was born in 1933, and during my lifetime, the United States changed from being a modest, comparatively nonintrusive and isolated, largely agrarian and only moderately industrialized, and utterly nonmilitarized nation (having no standing army to speak of, and in fact regarding those in the tiny professional military service at that time as being basically social misfits and parasites who could not find productive jobs) into the world's largest superpower, stalking the globe as the world's policeman and chief busybody, with such a lust for military adventures that eventually the militarized portion of the US economy grew so big that virtually every household in the US has some one who (1) works directly in or for the US military; (2) at one time worked in or for the military, and thus still receives substantial military welfare benefits; (3) works or worked in a research organization or a factory which, under a military contract or grant, supplies ideas or products to the military; or (4) otherwise has found that the best way for them to be all they can be was to do it in or for the Army.

As a consequence, by the end of the 1980s, the United States had become the world largest, and the only successful, command economy. In spite of all the rhetoric about the glory of free market capitalism that spews forth continuously from so many lips, in fact so many people sup at the trough of military contracts and entitlements that it is not too much to say that the truly "free market" sector of the US economy became over the past 60-odd years largely just some yummy frosting on an otherwise very tough command economy pound cake.

When the Cold War suddenly, unexpectedly and quite undesirably came to an end, the rationale for this entire, largely unacknowledged command economy

came to an end as well. While there have of course been cutbacks and layoffs in the militarized sector of the economy, that there have not been more is not due to the fact that we must remain armed to the teeth--if not to the moon--in anticipation of some as yet unidentified rival superpower; it is that so many people in the US, and around the world, are dependent on our command economy that if we were to cut back sufficiently to meet any credible military threat, our real economy would look even worse than that of Russia today.

And the reason for that is that the creation of the US command economy was achieved ultimately during the days of Voodoo Economics of the 1980s which, while enormously enriching a few, caused the US to sink further and further into a yawning black hole of debt. By which I do not mean only the well-celebrated and hotly-debated national debt, which, though lessening temporarily, is horrifying enough, but the largely unacknowledged levels of corporate debt, much of which has been "disappeared" by bankruptcy, write-offs, and government bailouts so that the CEOs can return to "GO", collect \$200 dollars, and start all over again.

But the mightiest anchor which may eventually drag the US ship of state to a halt and to its demise is the massive and again-growing levels of consumer debt--debt accumulated by ordinary Americans not only while the economy was said to be growing, as in the 1980s, but even now, while the economy is dead in the water, or at best said to be moving ahead dead slow over the flotsam and jetsam of hundreds of thousands of unneeded workers, white collared as well as blue, who have recently been discharged from their unnecessary labors by corporations, private as well as public, worldwide.

Of course, as a consequence of all this "rightsizing", the "economy" is said to be recovering. Unfortunately the people are dying. Wallace Peterson correctly calls it "the Silent Depression" and the end of the American Dream [See also, Drucker, Figgie, Jay & Steward, Krugman (2), Kurtzman].

Yes, it just doesn't get any better than this--for most Americans, that is: some folks surely can expect to continue to be quite filthily rich for the foreseeable future. But the US government, per se, is not like to be one of them. So why anyone would chose to tie themselves ever closer to the sinking American economy is beyond me. That American capitalists might want to keep themselves afloat by stretching their sinking hands across the border, I can fathom. But I think they only deserve a hardy handshake, and a release to an early grave before the entire hemisphere sinks below the frothing waves of debt and inequity.

However, this is only part of the story, and (as arguable as you may find it) the more conventional half at that. The global slide to world depression is, in my opinion, mainly due to our failure to see that we live in an information-rich and materially-abundant post-industrial society which no longer requires the amount and kinds of human labor, including mental labor, that were required previously in the industrial era. This means that the need for human labor in the production and distribution of goods and services will continue to decline, and could be encouraged to do so even more rapidly if we so chose.

Arthur Shostak, a futurist from Drexel University, was quoted by Carol Kleiman in the "Jobs" section of the Chicago Tribune of July 17, 1994, as

saying, "What we have to look forward to is that the only jobs that will be good jobs in the 21st Century will be ones that smart machines cannot yet perform." I think he is correct, but I would put special emphasis on the word "yet." There are very few such jobs I can imagine, and the ones which Drexel does mention--cyborg technicians, asteroid miners, and holographic inspectors--probably have a human half-life which is very short indeed. Caring for other sick, poor, and hungry humans, and for poor old ravaged Mother Earth, is more likely to become the major focus of human activity over the next century.

Nonetheless, our political, economic--and educational--institutions have stubbornly insisted on trying to continue to operate as though the obsolete industrial principles and values still make sense. Once, in the 19th and early 20th centuries, these principles and values arguably did make sense. Now they certainly don't. And since our schools and universities continue to try to pump people into an economy that doesn't really need them to produce or manage goods and services (but which does still need them to consume the goods and services produced without their labor), we are approaching terminal crisis.

If you think things are bad in the former Soviet Union because of the inoperability of its old economic and political system, just wait a few years for the future to catch up with the West. In the 1970s, much of the 3rd World of dependent capitalism went over the economic cliff; in the 1980s, the 2nd World of really-existing socialism followed the Third World to economic destruction; and now it is our turn: the demise of really-existing capitalism which not only has little relation to true free market economics, but also more importantly has failed to care about the future, and instead has robbed and stolen from the future in order to stand tall in the present for a few brief moments in the sun. I might add that it has often been remarked in the past that Russia was the wrong place to try out the ideas of Karl Marx. I think it is an even worse place to try out the ideas of Adam Smith.

I of course do expect the current EastAsian "economic miracle" to continue in the short run, although it is not clear to me that Japan will ever return to the brief and bright prominence it had briefly in the 1980s. However, from conventional and narrowly economic perspectives, the future of all of the Confucian societies (Japan, the unified Chinas, the unified Koreas) look pretty good.

Similarly, the short-range economic future of Southeast Asia (especially Indonesia and Malaysia) looks good, and a short-lived "economic takeoff" for India seems possible.

Yet all conventional economic growth and development is, in my judgment, doomed at least by the midpoint of the 21st century, if not sooner (or later!).

On the one hand, the tsunamis of population growth and environmental collapse are about to drown all conventional economic theories and practices. On the other hand, the old "future" of so many of the earliest futures seems to have arrived.

Economic theories, policies, and practices which deal effectively with both environmental constraints and new technological capabilities are urgently needed. Though many new theories deal with the environmental constraints

[Block, Ekins & Max-Neef, Henderson, Kotlikoff, Robertson], and a very few with the new technological capabilities [Jones], I know of none which deal with both convincingly, and so most of us plow blindly on ahead believing that 1950s-style "economic development" is both possible and desirable.

A fifth tsunami deals with governance. Basically, I believe that the nation-state is essentially dead as an instrument of effective governance, although its dead hands will continue to lie on the levers of public policy long after they can manipulate anything but our (more often than not) harmful "patriotic" emotions. Certainly everyone in the world needs to understand that the United States, per se, is too bankrupt (intellectually as well as economically) to be able to put its money where its mouth is any longer. While it continues to mouth off, and to rattle its sabers, these are more likely death rattles, or at least the sound of a superpower becoming an ordinary country, than anything to be taken too seriously.

I do think it is possible for the states of the United States, together in regional clusters, or separately, to become more or less effective units of governance, but probably not the Union as a whole. Indeed, most people who are thinking about governance issues now are trying to invent, or restore, forms of government smaller than the nation-state--closer to the people, and "the people" in smaller and smaller (or at least more and more narrowly and exclusively defined) communities [Rohter].

But a few people have been thinking usefully about global governance. I wish more would do so. New forms (indeed, new definitions and understandings) of democratic, global governance are very desperately needed. Very little help is being given in this by professional political scientists or lawyers, though there are a few pockets of hope which should be recognized and nurtured [Cleveland, Rosenau & Czempiel. Also Saul Mendlovitz and the members of the old World Order Models Project] .

I myself see no bright future at all for historical forms and practices of representative, liberal democratic governance. The forms are clearly obsolete, and while many of the principles are extremely important, they generally are far too narrow, responding to concerns often 200 years old, or at least responding to them in concepts and ways that are 200 years old. To repeat, almost all of these concerns are still vital now, but there are also many more concerns (dealing with the tsunamis already mentioned) about which our current democratic principals are absolutely silent--or can be forced to "speak" only through the most tortuous reinterpretation of the old words and procedures [But see Becker, Slaton, van Steenberg. Also relevant to civil governance are Barzelay, Berquist, Halal & Pourdehnad, Maynard & Mehrrens, and Pinchot. Of especial importance is the Committee on Viable Constitutionalism, established by Fred Riggs of the University of Hawaii].

The future of autocratic and authoritarian forms and principles of governance is much, much brighter than any form of democracy, old or new, I regret to say.

The Sixth and Final tsunamis involve the globalization of everything, including cultures and the emergence of a wholly artificial world. While one of the major newly emerging forces of the

present is that of the empowering of long-marginalized ethnic and cultural groups (it certainly is a very big and rising force in Hawaii), even that revitalization is informed by, and in many ways made possible by, the globalization of all of the previously-mentioned tsunamis.

Indeed, purely local cultures focusing on unique and wholly local matters are a less significant forces for the future than are (1) the regional and global interaction between the many and diverse (and often largely "invented") local cultures; (2) the creation of new global cultures--deriving from present and renewed cultures, but becoming new and separate cultures of their own (note please that I do NOT see the emergence of a single global culture, but of many competing global cultures); and finally (3) we will witness the emergence of the many totally new different cultures of robots, cyborgs, and the other various forms of artificial intelligence.

Several years ago, I came to the conclusion that the "end of nature" (but NOT the "end of ideology" or "end of history") thesis, which enjoyed a few moments of popularity recently, was correct, and, if anything, understated. I tried to weave together some of the strands of those developments I was familiar with, and presented my conclusions in a paper entitled, "It's Only a Paper Moon," published in the British journal, Futures (December 1990).

My point is that we live in a largely, and increasingly, artificial world. Nature, in the sense of places and processes wholly uninfluenced by human activities, past, present and future, is rapidly diminishing, if, indeed, "nature" in that sense exists anywhere on earth any more. Therefore, if we wish to survive, much less to excel, in the future, then we humans have to recognize that, and stop wasting our time trying to "save" or "preserve" nature, which no longer, or soon will not, exist to save or preserve. Instead, to use the phrase of Walter Truett Anderson, it is our human responsibility--not a choice, not an option--but our human responsibility to "govern evolution."

It is our duty because it is human actions in the past and present which destroyed nature. It is our duty because unless humans assume responsibility for the future of all life on this planet, there won't be much, and perhaps won't be any, life in the future, because of our past and present actions.

And, says Anderson, and I agree with him, it is no argument against this to say that we humans don't know enough to govern evolution. Too bad! We should have thought of that 10,000 or so years ago when we first radically altered our life styles and environment and began our first engineering and mega-engineering projects which, along with (shall I say) "natural" processes, resulted in massive destruction of long-existing environments and species, including, perhaps, other hominid species, and certainly hundreds if not thousands of other human cultures. And, even if we couldn't have known then what we know now, we should at least have begun evaluating our actions of 200 years ago, during the industrial revolution, and resolved that if we were going massively to modify "natural" processes in the pursuit of industrial growth, then we had better be willing to take responsibility for the future by governing evolution.

So, to say we don't know enough to assume that responsibility is no excuse. It is, says Anderson, like telling a teenager that he should wait a few years until

he is older and wiser and better prepared to handle the changes he will experience before going through puberty. That is probably true enough, but wholly irrelevant. He has no choice. He must plunge into the joys and sorrows of puberty before he is ready for it. And humans now must begin to attempt to govern evolution before we are ready for it.

It is not that we are on the "threshold" of creating a wholly artificial world--we passed that threshold long ago. But what we have not yet created--and what we need--is a vision which places all human activities within a context of human responsibility for governing evolution. All of our present plans and activities must be conceived and designed within an overarching moral and political framework which recognizes that, ready or not, we are now responsible for the future of life, and thus that everything we do, or don't do, must be done as a consequence of our admission and acceptance of that responsibility.

However, you undoubtedly noted (I must add, unfortunately) that you can **not find among my tsunamis even a ripple** that indicates that humans are becoming aware that they must take responsibility for continued evolution, even though it is these tsunamis, and more, which make that awareness so terribly important, I believe. We are in the midst of a period of extraordinary opportunity--and peril. This is one of the few times in history where doing nothing--that is, when trying to hold on to old ways--is dangerous. And yet, it is in this period of peril and unprecedented opportunities that we seem to have run out of ideas--and of courage and vision. Instead of leaping gloriously and courageously ahead, many of us have reverted to the most cowardly forms of fundamentalism, by which I do not mean just religious fundamentalism, but also economic, political, cultural and even environmental fundamentalism [See Lewis]. Instead of imagining and creating new and challenging perspectives, many of us have returned from the musty past with theories and practices wholly inappropriate for the world of the onrushing tsunamis.

In the recent book, Facing Tomorrow, Thomas Hine wrote that "For at least two decades, no compelling comprehensive vision of the future has captured the American imagination. Our culture is like a child raised without adults." "We used to have contempt for our ancestors and envy our descendants. Now we look wistfully towards our ancestors and think of our descendants hardly at all. The future was once a radiant city; now it's a slum".

And since North Americans understandably don't want to look at a slum, they pretend the future isn't there, and bask in the sunset of the present.

But how about you? Won't you please help us create awe-inspiring, beckoning, achievable visions of the future? For the rest of the Conference, as we spread our baskets on the beach and prepare to have a nice picnic, all the while complaining about the ants eating our sandwiches and the sand in our drinks, remember that the dull roar we hear in the background may be coming from the onrushing tsunamis of change. The wisest thing for us to do here may be to wax up our boards, turn around and study the ocean, pick our waves, and then paddle out to surf them.

We can't ignore these waves. They won't go away. They will sweep us away if we don't try to ride them. They might sweep us away even if we do try. But I dare you to go for it. Come on: Surf's up!

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