## TWENTY QUESTIONS: TECHNOLOGY AND SIMPLE LIVING

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### 1. Introduction

The issues are clearly not related just to technology, but are deeply rooted in society and our philosophies, cultures, and traditions. Our technology and industrial development are not separate from our culture but are a necessary expression of it. Therefore we must further examine, understand, and change the societal underpinnings that create the propensity to abuse the resources upon which we are so dependent. Failure to do so is simply treating the symptoms. (Dixon, 2002:419)

### 1.1. Bringing Mindfulness to Technology

When I was growing up in 1950s and '60s North America, technological optimism was rampant. We "boomers" were the first children of the Atomic Age which promised "electricity too cheap to meter" (despite the ever-present cloud of nuclear annihilation hanging over our heads during the Cold War). We saw humans become a space-faring species, building enormous submarines, transplanting hearts, growing babies in dishes, and eventually building computers and televisions that could fit in the palm of your hand. We spliced genes, engineered the Green Revolution, and wove polymers tight enough to stop bullets. We've not only automated the production of automobiles and rubber duckies, we automate everything, from agriculture to sex toys. These accomplishments are as amazing as sometimes they are trivial. There is no doubt that our lives would be extremely different, and most people believe, much worse, if all this technology hadn't been invented. The litany of achievements is truly dazzling, and credit should be given where credit is due.

On the other hand, our success with inventing new machines and materials, new processes and products, has induced a sort of culture-wide enchantment. We're entranced with the work of our hands and perhaps this is why we so often refer to these achievements as "magic" or "miracle" (cures, drugs, sound systems, skin treatments, whatever). From our experience of the very considerable list of things that technology can do for and to us, we have come to believe, broadly speaking, that technology might be the answer to nearly everything. In particular, we look to it to solve the sustainability crisis. Very many people today are technological utopians. In secular circles anyway, belief in technology has superseded belief in God as the most likely source of solutions for our problems, if solutions exist at all. Indeed, we mark our progress as a species in terms of technical achievement rather than evolution of our physique or improvement of our character (Segal, 1999: 119-158).

The popularity of looking for technical solutions to the sustainability crisis is evident in many places. "Green consumerism" has already been with us for a generation. It aims to deliver products and services that are less environmentally harmful—in themselves welcome additions to material culture. But green consumerism mostly doesn't question the fundamental narrative

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of consumer culture, that well-being is achievable through consumption, and even more so through green consumption.

But calls for "better technology" as a solution to environmental abuse have been with us at least since the first Earth Summit in Stockholm in 1972, repeated in the World Conservation Strategy in 1980, the Brundtland Commission Report in 1987, the UNCED in Rio de Janeiro in 1992, and all the calls since the Brundtland Commission Report for a "factor ten economy" (a global economy that can sustain economic growth at 3%+ per annum, but this while using only 10% of current resource and energy demand). Technical advancement is also a perennial theme at The Rocky Mountain Institute in Colorado, and numerous other efficiency and conservation-oriented agencies, departments, and NGOs worldwide. Of course, better technology is essential and we can only say, bring it on! But rarely do these earnest proposals include any critical analysis of consumerism itself and just what sort of culture we should be striving more efficiently to sustain (Rapley, 2002: 170).

Even a survey of Internet media devoted to reporting the most "hopeful" developments in meeting the sustainability challenge, Treehugger.com, Worldchanging.com and Grist.org, all report mostly technical developments. Much less glamorous (and less frequent) are stories related to culture, politics, or individual transformation. Chris Turner's (2007) book, The Geography of Hope, offers almost exclusively examples of hopeful technical developments such as renewable energy systems, Earthships as sustainable housing, green building standards like LEED (Leadership in Energy and Environmental Design), new developments in electric cars, etc. Of course it's exciting to hear that the residents of the Danish island of Samso adopted renewable energy systems (wind energy and solar district heating) years ago, and have since made renewable energy a mainstay of the island economy. But what interests me far more is how did the residents of Samso come to a consensus to implement such policies? Turner's explanation of a couple of guys offering free Tuborg at a tavern while introducing the proposal to local residents with low key reverse psychology, charming as it is, just doesn't seem either adequate or replicable. I certainly have nothing against Tuborg, and Turner himself discusses more than just the technological aspects of Samso's story. Nevertheless, I came away thinking more about the gadgets that made for Samso's renewable energy revolution than about the complex of interacting attitude changes, aha! moments, visionary public policies and tax incentives, and probably a host of other non-rational factors which must also have been at work making the transition a reality.

What role does technology play in consumer culture anyway? Is the consumer culture approach to technology adequate for meeting the sustainability challenge, even though it also plays an enormous role in creating that challenge? And what role might technology play in a culture oriented toward mindful sufficiency and simple living?

### 2. TECHNOLOGY IN CONSUMER CULTURE

The role of technology in consumer culture is parallel to its role in capitalism as a powerful driver of economic growth. The goal of capitalism is the expansion, accumulation and concentration of profit. The purpose of technology under capitalism is to secure competitive advantages that increase profits. Any technology that increases profits and is not illegal, or that can even temporarily be fit into a loophole in the law, tends to get developed. Unprofitable technologies, or those which might compromise existing patterns of profit-taking, no matter how beneficial they might be, are generally not developed. Even most "pure" scientific research tends to be biased toward problems which may hold future profit potential.

Subordinate, but clearly linked, to the profit motive as a driver of technical development are its other goals in consumer culture: social and environmental control; comfort and convenience; entertainment; and obsolescence.

Next to profit, military and security technologies are of major importance in consumer cultures—the social control focus for technical development. Indeed, the partnership is close to perfect, since military and security-related technologies are also immensely profitable, quickly become obsolete, and when used in war to destroy more important infrastructure become a means for multiplying profit even more as rebuilding follows conflict. Since capitalism is an inherently paranoid economic system, it is prone to become obsessed with security issues.<sup>2</sup> Since capitalism appropriates an ever-increasing fraction of resources and carrying capacity in order to fuel growth, it is continually in danger of over-shooting the carrying capacity of the Earth (Wackernagel & Rees, 1996: 97-98). And since the extraction of resources can create resource scarcities and inequities, it can spark both regional and international conflict (Homer-Dixon, 1996: 359-365). Finally, it has been estimated that worldwide, as much as 35% of all research and development funding, capital investment, and scientists and engineers, are engaged in military or security-related industries (Renner, 1990). In fact, so entrenched is military research and production in the economies of developed countries that, in the unlikely event that people actually did "give peace a chance", it would cost hundreds of billions of dollars to demilitarize them (Renner, 1995). Clearly, if war, the preparation for war, and operation of peacetime security establishments can be considered examples of "social control," then the technology necessary for these tasks must be an important priority in consumer culture to command such a large fraction of its creative talent and investment capital (Wikipedia (a), 2012).

Parallel with the control of people is technology for the control of nature. In its pleasanter forms most of us can recognize technology at work in our home heating systems, refrigerators, and houses. These technologies shelter (some would say isolate) us from, or moderate the effects of climate on our daily activities. If the normal changes occurring in an environment make us uncomfortable or present an inconvenience, we use technology to modify them. So we heat our houses in winter, chill our food all year round, and almost everywhere use technology to protect ourselves from "the elements." The level of comfort and convenience we now enjoy is shared by more people in more different ways than at any previous time in history, even though it is mostly made possible because of cheap fossil fuels and the truly remarkable levels of power they place in the hands of individuals.

But environmental control technologies can also be applied at much larger scales. Examples include damming or diverting rivers, applying pesticides or herbicides to control "pests" or defoliate landscapes, modifying watersheds to make them more congenial for agriculture and most recently, modifying the very genomes of living things so as to bring the processes of evolution under human control. Biotechnology, while offering considerable promise to improve human welfare in many respects, has so far been used largely to

<sup>&</sup>lt;sup>2</sup> While it may sound like over-statement to suggest that capitalism is "paranoid" it's instructive to note that one symptom of paranoia is the belief that others are out to get you, and sometimes also by delusions of grandeur, i.e., that the reason others are out to get you is because you are really someone special, with special powers or insights or knowledge. While not a formally recognized diagnostic category, capitalism nevertheless bears marked similarities to paranoia, except under capitalism, others really are out to get you. They are your business competitors. Moreover, what makes you special and a worthy focus for their nefarious designs is your profit margin, your market share, and most of all, your patented technology, i.e., that special knowledge that makes your firm, under regimes of capitalism, a target not a neighbor in the same community.

consolidate corporate control over Earth's genetic resources and expand corporate profits through the patenting of life forms (King & Stabinski, 1999: 73-89; Mooney, 1999: 21; Shiva, 1991: 231-264). Many biotech innovations have arisen not from popular demand for a product like Roundup-Ready™ canola seed, but apparently from a desire to increase corporate profits at the expense of farmers and consumers, especially in developing countries. So far, such innovations appear to offer only marginal increases in yields or improvements in the nutritional characteristics of crops, but they are very effective at establishing corporate monopolies on the use of seeds.³

One could hardly offer an account of technology in consumer culture without mentioning its role in providing comfort and convenience. The last century saw an enormous bloom of gadgets intended to take over, or at least reduce and speed up, many tasks of daily living like cooking, cleaning, shopping, and communication. This process reached what could easily be considered a stage of over-development where the applications of technology reflect less a real need for something and more an obsession to mechanize everything that can be mechanized, even if it requires creation of an artificial market. Electric carving knives, battery powered tooth brushes, leaf blowers, foot spas, electric blankets, heated water beds, and cooking appliances designed for only one food like popcorn poppers, waffle irons, bagel toasters, wiener heaters—the list is practically endless. While everyone needs a bed to sleep in, one might understandably ask whether, in a world where millions of people have not even one bed, how North Americans can justify vibro-massage, automated self-adjusting, heated beds, or refrigerators with liquid crystal screens on their doors allowing internet access while looking for the pickles. Our culture of entitlement leads us to think that because we work hard we're entitled to high incomes, and high incomes entitle us to whatever nonsensical excesses we can afford, simply because we can afford them. Riches become self-justifying and marketing marginally useful products to gullible consumers is just considered good business. This practice is particularly questionable on the grounds that psychologists are now discovering that the very multiplication of "choice" can itself diminish our quality of life (Schwartz, 2004).

While there's certainly nothing morally wrong with being comfortable, the pursuit of comfort and convenience can create a momentum all its own that can lead to an inversion of values. Eating chocolate may be comforting and innocent enough as a "simple pleasure." But the pleasure is neither simple nor innocent when the cocoa was harvested by child slaves in West Africa (Robins, 2003). Oppression can even be found closer to home when one considers carefully the full cost of many of the gadgets that are flogged day and night as guaranteed to save us time and labour—which we hope to spend with our families and neighbors or engaged in other good works—only to discover that the time we need to earn the money to pay for these

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<sup>&</sup>lt;sup>3</sup> A signal example of this came to my attention during a conference on the future of agriculture being held in Saskatoon, Saskatchewan, some years ago at which I was a co-presenter. I listened with interest to a representative from a major cereal grains company telling those assembled that the future of growing cereal grains on the Prairies of Canada was in boutique specialty crops. The example he offered was of General Mills, a major U.S. multinational food manufacturer, who offered contracts to growers of oats for genetically engineered varieties of this grain custom tailored not for greater nutritional value, or productivity per acre, or taste, or disease resistance, but rather, because this variety of oats was specially designed not to stick in their Cheerio-making® machines. It seems that unless the doughy precursor of Cheerios® is just the right consistency, it can gum up the dies that make the little Os round. When this happens, the whole production line had to be shut down for an entire day until the dough could be cleaned out of the dies to restart the machines. Growing specialty oats for this sort of use was the future of agriculture, the expert advised us, not growing the generic varieties farmers were used to and, incidentally, for which they could save their own seeds. No. The new reality was growing specialty crops using specialty seeds and all under corporate control.

conveniences can sometimes leave us with less free time to enjoy them than we had without them. Moreover, it has been a perennial insight in the literature of voluntary simplicity that what is necessary to a decent life is relatively easy to obtain at little cost in time, money or labour. But luxury consumption is often provisioned only through excessive toil, dangerous enterprise, or exploitation of one form or another (Woolman, 1991).

Consumer culture also invests heavily in the technology of entertainment. When the daily round of one's activity loses most connection to the actual work of getting a living, then all that remains is to seek amusement. Home entertainment electronics and the vast communications infrastructure needed to support it is one of the fastest growing sectors of the economy. It is also certainly one of the fields which is most completely enmeshed with technical development. Middle class North Americans invest billions of dollars in computer systems, communication devices and services, and home theatre systems, to say nothing of the thousands of hours spent playing computer games and watching television (Inside Facebook, 2009). This technology has enabled a head-long plunge by an entire generation into various "virtual realities" that taken together can only be considered an electronically mediated mass fantasy. One young man of my acquaintance proudly described the hundreds of pages of detailed maps he had compiled while playing "Ages of Camelot," a popular on-line computer game. He knew every nook and cranny of this imaginary kingdom and all its denizens. But he was embarrassed to admit that he probably could not locate Sierra Leone or Myanmar on a world map. Even living in an officially bilingual country, he speaks more Klingon than French, and knows more about the history of Myst® than of the Canadian Federation. In essence, despite being intellectually gifted, he inhabits an imaginary world at precisely the time when his abilities are desperately needed in the real one.

Finally, we develop technology which itself is intended to increase consumption (and hence profits), namely: the science and techniques of design obsolescence on the one hand, and mass marketing on the other. Planned obsolescence has already been well documented but, inexplicably, most people in consumer cultures just shrug and accept rank exploitation of their time and incomes as part of "normal" living. I won't re-till this soil here, but only wish to point out that a great deal of product design and development effort is applied to assure that products which could last much longer don't. This forces us back into the marketplace to replace goods which have now become waste and which could have been designed for much longer and more efficient service. One example of misapplied engineering that I find particularly odious is the efforts of truck manufacturers to "tune" engine designs to make sounds that potential buyers recognize as "powerful," "capable," and "rugged." Engine efficiency, durability, and perhaps even safety are in the balance over against the impression the manufacturer wants to make on potential buyers. In the same category is the enormous effort, expense and ingenuity invested in marketing goods and services, including over-packaging, excessive and uninformative advertising, and the whole machinery of public relations that promotes consumerism. All of this is especially egregious when the technology concerned is approaching the limits of efficiency that are theoretically possible. For example, we can now manufacture home furnaces that are 94% efficient in converting natural gas to heat. With this level of performance available, why are such devices being manufactured to last only about 10 years when we could design them to last 100 years? Could this really be because consumers demand the right to replace their furnace often? What is to be gained by unnecessarily replacing a furnace nine times except increased waste and corporate profit?

The development of technology in consumer culture has been criticized on a number of fronts including the tendency of technology, when linked to a capitalist economy, to outrun its resource base (Wackernagel, (et al.), 2002: 9266-9271). It happens that in some quarters, people not only admit the damage that technology can do, but continue to look to even more technology to fix it (Homer-Dixon, 2001). Yes, it is generally agreed, consumerism as a way of

life has polluted large expanses of the Earth, but nanotechnology and biotechnology will lead to machines and organisms that will safely dispose of the wastes from previous rounds of overconsumption. How soon we forget that one of the key reasons automotive technology was embraced so enthusiastically was that it helped eliminate solid waste and health problems associated with wide use of horses in urban areas—thus ultimately trading a manure problem for climate change, traffic congestion, and the highway death toll.

Herman Daly has pointed out that, while it is hazardous to underestimate human ingenuity and technical innovation, there are few historical examples of new technologies offered as answers to old problems which have not also brought their own new problems and risks in the bargain (Daly, 1995: 180-194). Cars speed up long distance travel but incur serious casualties and are a major source of air pollution. Nuclear fission promised energy "too cheap to meter," but incurred highly toxic waste handling challenges and major security issues. Antibiotics initially cured serious diseases but have now given rise to even more virulent antibiotic-resistant pathogens. Jet air travel allowed circumnavigation of the planet in a few hours but now presents a significant terrorist threat, a conveyor belt for pandemics, and a high altitude threat to climate stability and the ozone layer. As Daly also pointed out, no matter how much ingenuity we have on hand, every idea requires high quality resources and available waste sinks before it can actually be built and used. If the current growth-oriented lifestyle of over-consumption runs its course, it may be that high quality resources will be so scarce that new ideas cannot take material form as economic goods and services, no matter what their merits might be (Beriault, 2005).

Yet another consideration is the seldom mentioned time lag between the invention of a new technology in the lab and actually getting it into the homes of billions of people. Technological optimists are anxious to announce every new innovation or gadget as if merely to have thought of it makes it so. But every entrepreneur knows in his or her bones the many hurdles yet to cross between the geniuses in the lab and the customers in the marketplace. Taking a technology from concept to production poses a whole range of challenges in procuring adequate enough supplies of appropriate materials, obtaining the necessary licenses, studies and approvals before production can being, securing financing, scaling a process up from demonstration to actual production, meeting whatever challenges might be encountered in transport and distribution of the new widget, and then convincing the public to buy it, even if it does represent a real improvement over existing ways of meeting the same need. And all of this has to be achieved at a "competitive" price in the marketplace. This is not a short process even with expert leadership under ideal conditions, and conditions are seldom ideal.

Another concern that was pointed out over a generation ago by E. F. Schumacher is the fact that under capitalism, new technology tends to be labour-replacing (Schumacher, 1973). Since labour is a cost of production, reducing this cost will increase profit. Work is therefore "bad," and if machines can be built that replace human labour, there are powerful incentives to do so. Thus, the advance of technology tends also to increase unemployment with all the negative social and personal consequences that follow from it. It is ironic that a society that celebrates high incomes and the consumption of material things as defining the good life tolerates an economic system that grows unemployment even as it grows profits, thus assuring that fewer and fewer people can participate in the good life it promises. One way to obscure this unpleasant reality is to try to grow the economy so fast that jobs lost in one industry are replaced by jobs created in another, thus making it appear that "employment" is growing. But one "job" is not necessarily interchangeable with every other job. Jobs may be created in an economy without this necessarily translating into employment for flesh and blood human beings. "Job numbers" look fine, but there may still be many people who cannot find a way to make a living without sacrificing other important determinates of quality of life-friends, rootedness in place, community, a mortgage-free home, etc.

Research and development costs money. Under capitalism, money tends to be appropriated by capitalists (shareholders). This implies a concentration of control over technology, because it is corporations who have the most funds to develop new technologies which are then patented to limit access to and secure control over them. As technical development moves forward, control over the technology tends to become more centralized and more privatized. This isn't necessarily the most favorable arrangement for people who have well-being in mind rather than profit. It is mainly the profitability of a technology (constrained only by whatever regulatory formalities are in place) and not its contribution to overall well-being that determine what we eventually see in the marketplace.<sup>4</sup> The development of new technologies are seldom if ever subject to public review. Lobbyists are paid large fees to ensure that new technologies escape as many regulatory screens as possible.

Suffice it then to note that the purpose of technology in consumer culture is, first and foremost, the generation of profit, but also social and environmental control, comfort and convenience, entertainment, and design obsolescence and marketing that stoke further rounds of consumption, hence making the system self-perpetuating. The development and implementation of technology tends to be capital-intensive, concentrated under corporate control, labour replacing rather than job-creating, and relatively unmindful of the promotion of overall well-being when compared to its other purposes. In this context, should we be looking to technology itself for the solution to the sustainability challenge?

#### 3. WHY TECHNOLOGY ISN'T ENOUGH

In 1905 in Kansas City, Missouri, there were only two privately owned automobiles. In July of that year, they succeeded in achieving the first recorded head-on collision. (Mooney, 1999)

Our confidence in technology as an instrument for meeting the sustainability challenge has considerable historical justification. Technology has made possible things that were previously thought to be impossible. Therefore, we perhaps feel justified in thinking that this will always continue and that technology will provide an escape hatch from the dilemma of immovable limits confronting limitless desires. In addition, since "technology" seems to be creating many of our sustainability problems, isn't it reasonable to expect that the solutions will simply be better technology? Sometimes missing from this confidence, however, is an appropriate appreciation for the role that fossil fuels have played in the triumph of technology, and how very dependent many of those triumphs still are on continuing, secure, and inexpensive supplies of these fuels—something which nearly everyone now recognizes as an unsustainable dependency.

I have already argued that a great deal depends on where we point consciousness, how we perceive our reality and what motivates our actions. Technology is just tools and know-how. Technology develops along lines which we set out for it, based on values, desires, and aspirations that don't themselves arise from technological or scientific considerations. While technology is extremely helpful in achieving our goals, it doesn't set our goals for us, nor does it

<sup>&</sup>lt;sup>4</sup> A particularly disturbing example of this has been the relative neglect by big pharma of the discovery and production of new antibiotics in favor of lifestyle drugs like erection enhancers, cholesterol medications, etc., because these drugs are used continually and are therefore a secure profit center whereas antibiotics are only used occasionally to cure real illnesses. The net effect has been to contribute greatly to the current crisis in availability of effective antibiotics and the development of antibiotic resistance by many common pathogens.

contain any goals of its own. The world we see around us, the world of ecological decay and interpersonal violence, is largely the world delivered to us by a technology we specifically designed to achieve the goals of a consciousness oriented in a certain way. Change the orientation of consciousness and our goals would change, and a new technology could evolve to serve it. In my view, technology as we currently deploy it is, taken by itself, a vain hope for resolving the sustainability crisis for the following reasons:

First, we have already argued that current technology serves the values of consumer culture. It aims to deliver mass material affluence, the very meaning of which implies waste, so as to generate profits which must continually grow. Consumption is the opposite of conservation, and growth without limits is the opposite of a stead-state economy which might have a hope of persisting over the long term. It is logically impossible that any technology can conserve and consume its resource and energy endowments at the same time. It's also logically impossible for any technology to deliver "sustainable affluence" when the very meaning of affluence implies generating ever-increasing mountains of indigestible wastes. The very definition of "sustainable development" framed by the Brundtland Commission (meeting the needs of the current generation without compromising the ability of future generations to meet their own needs), while certainly appealing to our wish fulfillment fantasies of being able to have our cake while eating it too, doesn't seem achievable with any presently imaginable technology and our current understanding of the laws of nature. We will not be investing in conservation technologies as long as our economy is oriented toward consumption instead, except when conservation can be shown to reduce production costs and hence increase profits. But this sort of conservation applies only to inputs which can be priced and generally entirely ignores externalized costs. Small won't be beautiful until we really believe it is. And more will be better as long as we continue to conflate quality of life with quantity of consumption.

Technical development in consumer culture is generally driven by capitalist markets. The operative motive then is greed, not planetary sustainability. In practice this means that technologies which might be environmentally restorative but which have little or no profit potential tend not to be developed or implemented, no matter what their merits. Conversely, technologies that have large profit potential tend to be implemented no matter how disastrous their environmental or social impacts. For example, technology has been proposed to construct artificial trees to scrub carbon dioxide from the atmosphere (as if living trees just aren't up to the challenge) so as to mitigate climate change, but it is not at all clear where the "profit center" would be for such a technology, except perhaps from industries hoping to offset their carbon emissions by paying for artificial trees. On the other hand, all lights are green for the further exploitation of Alberta's Athabasca tar sands which is an environmental disaster from beginning to end, but immensely profitable nevertheless (CBC-TV, 2001).

Third, technology has limits inherent in the laws of nature. No technology can arbitrarily reverse the laws of thermodynamics, for example, or the law of conservation of matter and energy. It is precisely because natural laws operate with ironclad consistency that marvelous things can be done which appear to violate those laws. Powered flight of heavier than air craft which appear to defy gravity, for example, is possible only because of the laws of aerodynamics. Therefore, unless and until scientists discover a way of making water flow uphill, creating matter out of energy, arbitrarily changing the properties of chemical elements or increasing their quantities, we must find a way of fashioning a good life on the planet we have, with the resources available, and within the general conditions needed to sustain a productive community of other living things. Such limits, while we often aren't entirely sure precisely where they are, are immovable whenever we hit them (Robert, (et al.), 2002: 197-214).

Fourth, no technology ever solves just one problem without creating other problems of its own (Tenner, 1996). This is probably because every technological introduction is being made within an already hugely complex and interdependent system of pre-existing

relationships which can result in consequences that are difficult to foresee. An example of this "mixed bag principle" can be found in the construction of large scale hydro-electric dams. Dam building projects are often sold by appealing to the many advantages they can bring to people including electrification, flood control, providing recreational water in dam back-bays, water for irrigation and drought mitigation, and jobs both during construction and following commissioning. But such projects also have their downsides. It's impossible, for example, to optimize a dam to deliver all of its potential benefits. If we want maximum power generation then water retention will be compromised. If we want maximum irrigation water available, we may have to reduce power generation and take a loss on power revenues. If we want to maximize tourism and recreational potential, then both irrigation withdrawals and flowthrough for power generation must be curtailed. While large dams operating at design efficiency can indeed generate cheap electricity, they have very high capital costs which must be serviced whether or not the dam is operating at peak output, and the availability of cheap energy may attract other industries into the area which can have other unwelcome consequences for both human and non-human residents. On top of all these trade-offs are a myriad of potential negative effects such as changes in downstream water ecology due to damming the river in the first place, flooding of back bays with possible displacement of preexisting natural and human communities (the Three Gorges Dam project in China, for example, has displaced nearly 3 million people from their homes and traditional livelihoods), back bay siltation which eventually renders the dam useless, land subsidence and increased seismic risks due to the weight of water behind the dam, and of course the potential for dam collapse with downstream flooding and loss of life. The larger the scale at which any technology is implemented, the larger the scale of both its potential benefits and its damages.

While technological mega-projects can certainly produce mega-problems, the mixed bag principle operates at small scales as well. For example, 70% of the contestants in Paralympics events are road accident victims. Low-nicotine tobacco has doubled the consumption of cigarettes. Motorists who have airbags and seat belts drive on average 20% faster than other motorists. More highways create more traffic; more lanes on the roads cause more queues. Crosswalks lead to more accidents involving pedestrians. To prevent the destruction of police cameras by speed demons, cameras have been installed to keep an eye on the speed cameras. The sturdier the chassis of a car, the harder it is to free the causalities trapped inside. Air conditioning affects the ozone layer, and contributes to the greenhouse effect. The cooling of offices, in other words, contributes to the heating of the atmosphere. Mad cows are the result of recycled butchers' waste. The consumption of paper in offices has increased since the introduction of computers. The development of cushioned jogging shoes intended to protect the knees has increased wear and tear on the hips. Filters for purifying tap water have proved an ideal breeding ground for bacteria. Suntan lotion is now suspected to cause skin cancer (von Boxsel, 2004).

I'm not arguing that technology must be abandoned in order to have a good or sustainable life. Far from it. I only mean to highlight that technology is a mixed bag, and sometimes a lethal bag. Since there are now very many humans trying to share the same earth, and we have already made a large and ever-growing footprint, and we tend to gravitate, for economic reasons, toward large scale technologies, and many of our technologies are highly toxic to living things—all of these facts plead for bringing more mindfulness to our relationship with technology. And this must begin with an assessment of whether we need a given technology in the first place—not simply its profit potential.

Fifth, while it is certainly possible to imagine better technology than we now have for addressing many human needs, it's hard to imagine any technology that would have no environmental impacts at all. Every "technology" is a process by which human beings convert natural resources and energy into other forms we find useful or amusing. No matter how

efficient or "green" this process may be, it will always create some waste, some expenditure of energy, some imprint left by extracting the resources needed to construct the product, in short, some change in the world. If we understand having a good life as limitless expansion of consumption, then no matter how green our technology, the human footprint on earth will inexorably expand. Better technology slows the pace at which this degradation occurs, but only replacing the consumer culture narrative of the good life promises to limit such damage definitively.

Next, we can see a curious paradox connected with the use of almost any "green" or conserving technology. This is the "Jevons' Paradox" named for the 19th century British economist William Stanley Jevons (Alcott, 2005: 9-12). Jevons observed that technological advances that increased the efficiency with which a particular resource was used (in his case, coal) resulted in increased consumption of the resource. It is probably a slight variant of this same paradox which can find even dedicated sustainability advocates making heroic efforts to reduce their consumption of certain resources like energy, only to take the savings they enjoy and spend them on more consumption. The tenacity of this paradox is evidence of how deeply rooted consumerist values can be in that when we want to reward ourselves for conserving choices, the first thing that comes to mind is something consumptive. An example of this is an acquaintance of mine whose concern for the environment is beyond doubt and who was thrilled to hear from me various measures she could take to reduce consumption of resources in her household. She then said, "Well, if I do all those things, I could probably save enough in a year to go visit my family in Britain!"—a trip which would have required air travel which would pretty much offset all the gains she achieved by her other household efficiencies. Thus it appears to be the case that as long as a consumerist worldview remains in place, developing and implementing more sustainable technologies may only shift consumption activities onto other classes of goods and services, perhaps with even higher environmental impacts than before.

Finally, every technology creates vested economic interests that once in place can become perverse to further progress on sustainability. The vested interests represented by oil companies and auto manufacturers are well known examples to everyone. But I encountered another instance of vested interest when I was invited to deliver a keynote presentation to a regional "environmental" industry association. While the 500 or so people in the room described themselves as the "environment industry" they were mostly owners and CEOs of waste handling and toxic clean-up firms. I was supposed to deliver an inspirational message about the importance of waste management and recycling to a sustainable economy as well as point out opportunities for development of their industry. I said, however, that if we were really serious about sustainability, every company in the room needed to start planning to transform itself into something completely different—maybe materials supply and reprocessing businesses, or something of the sort. When all the faces looked blank, I realized what they wanted to hear were ideas about new markets for their present businesses. What I told them was that their businesses currently depend on a steady supply of wastes and toxins that no sustainable society of the future could ever generate. Surely we would recycle materials. But the long caravans of compactor trucks heading for the landfills must become a thing of the past. If they wanted to thrive in the future, they must find a way of making themselves obsolete but stay in business in the process. My message was not well received. Nevertheless, we can find many examples of businesses, some of them quite large, that depend for their profitability on the continuation of problems we need to eliminate (Orr, 1999). In so far as they represent vested economic interests and voter constituencies, they can also be roadblocks to a more sustainable way of life.

#### 4. SEPARATING THE WHEAT FROM THE CHAFF: TECHNOLOGY AND MINDFUL SIMPLICITY

"If you would set to work creating the new technology, abandon all complex tools. They are misconceptions. All the brilliant discoveries and inventions of our times will be made with our minds and hands and senses, aided by simple tools and concepts." (Williams, 1973: 139)

In taking up the topic of how the role of technology might change in a culture oriented toward voluntary simplicity, it is of course tempting to spool off a list of present technologies that would disappear (cars, fossil fuels, etc.) and the alternative technologies that might supplement or replace them (bicycles, solar energy, etc.). The problem with this approach is that it can get us tangled up in debates about the leaves on the tree without giving any attention to the roots and the trunk. In any culture, the specific technical innovations that emerge will largely be determined by the values and consciousness guiding development of them. So for our purposes I would like to focus attention on these higher level issues and leave debates about the relative merits of different technical devices to those qualified to discuss them.

Certainly, any culture of mindful sufficiency would embrace technology as the powerful adaptive asset that it is. But I think it is also essential that technology would be subordinated to mindfulness and not allowed to run rampant as it does in consumer culture. Part of this "subordination" (i.e., to assign something a lower place) involves continuous and clear mindfulness of technology as a means to an end, and not an end in itself. Moreover, the end that technology exists to serve is the well-being of the whole life system of the Earth, not mere comfort, or mere profit, or dominance and oppression of others, or pleasure heedless of its consequences for others. Finally, a guiding value would be that of sufficiency; that technology is something we use to make sufficient provision for legitimate needs, not to maximize consumption for its own sake.

But just how, in a practical sense, might we subordinate technology to mindfulness and the requirements of a way of life expressing sufficiency rather than affluence? This implies bringing some measure of mindful discernment to each new technological enterprise, whether that is a decision to develop a new technology, to adopt one already developed, or to continue to maintain something already in place. We envision here an unhurried, deeply, introspective "holding" of a proposal, idea, or project in awareness so that the full range of our perceptions and intuitions can arise in response to it. We need to take time to consider as many of its relationships, implications, and possible consequences as we can foresee. The process of holding a technology in mindful awareness, together with interrogating the technology in terms of certain principles and values, I will call "discernment." So let's address the question of subordinating technology to mindfulness in two parts: (a) what principles and values might we use to interrogate technological development in order to subordinate it to mindful sufficiency, and (b) who has authority to perform this task of discernment and implement the results?

One way of structuring our consideration of technology is first to identify three levels at which we can bring mindfulness to technology. I use the word "levels" deliberately, because they represent what I see as a non-negotiable hierarchy of dependencies that arises from the nature of how things work on our planet. Levels cannot be substituted and they cannot be arbitrarily re-arranged. Moreover, the levels cannot be "balanced" as some models of sustainability now try to do, because they are not competing political constituencies who can be satisfied through skillful compromises where every party "gives a little." A technology contributes to a culture of simple living and mindful sufficiency when it passes various tests of discernment at all levels. If it violates any of the tests at any level, the technology is more or less toxic to sustainability. I make no claim that the criteria I am proposing are exhaustive. My aim in identifying these criteria for discernment is to keep them as simple, and few in number as

possible while also assuring that they have substantial scientific and ethical coherence. Moreover, I am not aiming to create any sort of quantitive "protocol" that can be applied mechanically to the evaluation of technologies, but rather a framework or sort of check list that can holistically enrich and inform intuitive discernment as to what is or isn't good for us and the planet.

Most readers of the sustainability literature will be familiar with the customary appeal to ecological, economic and social dimensions of sustainability. I'm happy to adopt these as the three "levels" at which we interrogate technology, but with the following proviso—which is not always customary: In a sustainable culture, the economy is a system which synergistically resides within society just the way a cell organelle might reside synergistically within a cell, or a cell reside synergistically within an organ or larger body. Correspondingly, human society resides synergistically within the ecosphere, the community of all life on Earth. I want to stress that the nested relationship of these systems, the ecosphere being the largest and most independent, with human society carried within, and the economy within our society, is nonarbitrary and non-negotiable. Should economic activities in any way contradict the requirements of human social well-being, then they become toxic (oppressive, prejudicial, inequitable, unhealthy) to sustainability and seal both their own demise and perhaps that of the society within which they subsist. I say "perhaps" because a toxic economy might, in a society that can subordinate its economy to mindfulness, be replaced with a differently structured economic system that is less toxic. Likewise, certain aspects of culture (the complex of functions, beliefs, etc. that define a society) can be toxic to the long term relationship between people and the ecosphere. These toxic aspects of culture may be expressed through the society's economic system, but they could be expressed in other ways as well. Evidence suggests that Easter Island society nearly extinguished itself by depleting island resources, not in pursuit of material affluence, but through religious and possibly social competition for status expressed through statue building. In the end it came to the same thing—decimation of the island's ecosystems and near extinction of its human population.

So I'm suggesting that we interrogate technology at three levels: the ecological, social and economic. But what questions shall we pose? There have been a great number of principles, guidelines and requirements suggested for a sustainable culture by a variety of proponents for at least forty years. It is beyond the scope of this chapter to review and debate them all. My aim is more modest. I hope to offer an approach with representative criteria of how this discernment process might work. We must fully appreciate that if serious action is taken on this proposal, it will probably entail a protracted process of discovery and trial and error construction of a more definitive and well-documented list of discernment criteria. Nevertheless we must make a start to get the idea. As a general principle, it would seem beneficial to seek the fewest number criteria at the highest level of generality and applicability as possible. Many sustainability criteria that have been proposed over the years have been variations on the same fundamental themes. Our aim will be always, in this present exercise and afterward, to seek out the simplest and most universally applicable themes so as to yield the shortest and most lucid list of discernment criteria.

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<sup>&</sup>lt;sup>5</sup> I fully appreciate that this topic overlaps the traditional field of sustainability indicators with all of the complications this involves. But I'm hoping to frame this discussion not in terms of the technical aspects of the metrics involved in measuring sustainability performance or environmental damage, but rather taking a step back to the level where the discussion has more to do with what we value than how we measure it. This approach assumes that the decision to undertake or abandon any technical development consists of at least two parts: (a) the matter of whether or not such a development should be undertaken, that it's something we want, that it's something that will advance the core values and aims of our way of

#### 5. ECOLOGICAL CRITERIA

The ecological criteria for sustainability are much easier to specify than to implement. They are essentially based on laws of chemistry, physics and ecology which represent non-negotiable limits on human activities within a living and productive ecosphere. One of the most succinct and well-documented statements of these principles is available in The Natural Step system conditions (Robert (et al.), 2002: 197-214). I am paraphrasing the first three system conditions, which directly relate to ecological sustainability, to put them in the form of questions that we might ask ourselves about any given proposed or existing technology in order to discern its consistency with a culture of mindfulness and sufficiency.

## 5.1. Will this technology systematically increase concentrations in the ecosphere of substances from the Earth's crust?

"Substances from the Earth's crust" consist of any minerals that can be mined from the crust of the Earth including fossil fuels. The concern is that as people extract these materials and concentrate them at the surface of the Earth without recycling them, or burn them and release their combustion products as is the case with fossil fuels, the concentrations of these materials will accumulate in the ecosphere until they reach some point, often unknown, when changes may occur to the ecosphere that threaten life in general, or human life in particular. We have only to look at the growing evidence for climate change driven by our use of fossil fuels for a prime example of this concern. But minerals yielding metals such as lead, mercury, cadmium, arsenic, and fissile materials like uranium all present risks of their own. Moreover, they are risks to all living things, not just humans.

But not only must we be concerned about minerals and metals that are toxic in their own right, non-toxic metals like iron, aluminum, tin, etc., require very energy intensive refining processes thus represent high levels of what is called "embodied energy"—the energy needed to refine them from their parent ores. As these materials are manufactured into products for human use, they tend to be dispersed around the world in very small amounts, i.e., the "waste" represented by the worn out product which may not be recycled. An unsustainable economy is one that continually "leaks" materials derived from limited deposits of high grade ores to millions of small waste dumps, landfills, waste middens, and other locations around the world, none of which is large enough or close enough to a sizable market to qualify as a future "high grade" deposit of that metal or material. The result is that future generations will have to invest even more time, labor and energy to collect and re-concentrate these materials so that they are once again industrially useful. In many cases they will have been combined in alloys or composite materials so as to make them impossible to recycle at realistic levels of energy and labor investment.

Thus, the extraction of minerals from the Earth's crust represents a double threat: (a) the threat of direct toxicity due to the chemical properties of some metals themselves, and (b) the threat that all materials from the Earth's crust are being extracted and dispersed in the ecosphere in such small amounts or in such adulterated forms that they become economically lost to future generations. Minimizing these dual threats implies: (a) reducing our use of materials mined from the Earth's crust to such levels as can be replaced by the natural geophysical processes that concentrate such materials in the first place (regrettably, an extremely slow process), and/or (b) after mining and refining such materials, to use them only

life, and then (b) how specifically do we measure the impacts of this or that technology (the indicator question per se).

for essential applications and with the most scrupulous attention to conservation and recycling, and/or (c) developing substitutions whereby materials that are scarce, toxic or energy intensive to procure from nature can be replaced by materials that are more abundant, less toxic and less energy intensive to procure.

## 5.2. Does this technology contribute to systematic increases in the concentrations of substances in the ecosphere produced by society?

The technology developed and deployed by consumer culture is continually manufacturing things (substances like plastics, persistent pesticides, CFCs, PCBs etc.) that persist in the ecosphere for long periods without biodegrading. Sometimes these materials are carcinogenic (cancer-causing), mutagenic (mutation-causing) or teratogenic (deformity-causing) on their own. Sometimes, as is the case with many plastics, manufacturing them is toxic, or else they simply break down in the environment into smaller and smaller particles until they are ingested or otherwise interfere with other plants and animals (e.g., as when birds, fish or ocean mammals become entangled in plastic wrap, fishing nets or other detritus, or when birds, fish and turtles ingest bits of plastic thinking they are food). The large-scale process of human beings converting materials derived from the ecosphere, even materials that are "renewable" like forest products, represents a gradual conversion of the living, biodegradable systems of the ecosphere to a gradually more artificial, non-living and non-biodegradable waste heap. The concern is that if this way of life continues, a way of life that conflates maximizing consumption of this sort as constituting the good life, these materials will reach concentrations, often unknown, when changes may occur to the ecosphere that threaten life in general, and human life in particular.

A culture of mindful sufficiency must thus orient its technology so as never to produce goods from human-made substances that are persistent in nature and use instead materials that are abundant and biodegradable. No matter what goods are produced for human use, we must use even renewable resources with scrupulous attention to conservation and efficiency, and to minimize the "population" of human-made artifacts absolutely, i.e., to live simply. By so doing, we leave the maximum possible share of the ecosphere in its pristine state upon which we depend like the rest of the living community of the Earth. Technologies which promise this result would pass this criterion of discernment.

### 5.3. Does this technology avoid systematic physical degradation of nature through overharvesting, introductions and other forms of modification?

In its greed to accumulate profit, consumer culture cuts a wide swath through ecosystems in search of what it's after. Commercial trawler fishing operations that capture every species of fish of any size in order to keep only the merchantable species and discard all the rest as "bicatch" is one example. The use of herbicides that kill every green thing except a crop plant of interest such as RoundUp Ready Canola® is another example. Alien species are introduced to ecosystems in attempts to control populations of other species considered to be "pests" such as the cane toads introduced to Australia in 1935 with the intention of controlling cane grubs threatening sugar cane crops. The toads themselves become a toxic plague on the landscape.

Perhaps some of the most significant "introductions" to ecosystems are "estrogen mimickers"—invisible chemical compounds that behave in the body (both of animals and humans) in ways similar to the hormone estrogen, "feminizing" the organisms ingesting them resulting in both increased cancer rates and impaired reproductive function (Biello, 2007; Environmental Health Perspectives, 2005.). Introductions, over-harvesting (CBC-TV, 2010.) and other forms of modification such as genetic manipulations or radical and large scale

alteration of habitats are all ways that human beings change or reduce the ability of ecosystems to reproduce and also to maintain both their genetic and species diversity. This implies that over time, ecosystems are becoming less diverse, less resilient, and therefore more at risk of catastrophic collapse when subjected to either human-caused or natural stresses. No ecosystem can be maintained if its ability to reproduce itself and maintain its diversity and variety is being systematically destroyed by human beings. The concern is that if the consumer culture way of life continues, human-caused degradation of ecosystems, introductions and over-harvesting of resources will reach some critical level, often unknown, when changes may occur to the ecosphere that threaten life in general, and human life in particular. A culture of mindful sufficiency must thus orient its technology in such a way as not to systematically reduce the productivity of ecosystems, their genetic and species diversity, nor to introduce exotic species or toxic substances that dramatically impact the ability of such systems to replicate themselves.

## 5.4. Will this technology operate at such a scale as to appropriate global carrying capacity which is prejudicial to the interests of other species?

Not present among The Natural Step criteria for ecological sustainability is any mention of the proportion of carrying capacity appropriated by human beings compared to the resources which are left available for the needs of other species. This concern, that the criteria we use to interrogate technology reflect only the value we place on human life and not also value other species, is an issue that bridges ecological and social (equity) criteria. I mention it here because we must be concerned with the overall scale of the technology we use lest we more or less satisfy the first three criteria above and in the end still turn the Earth into a great human plantation. Mindfulness practice reveals to us that we are members of a vast living web of interdependent beings the majority of whom are not human. The scale of human activity on the Earth facilitated by technology is already large compared to the ecosphere itself. A culture of mindful sufficiency would therefore likely be concerned to interrogate its technology respecting its scale and the implications that large scale technologies would have for the well-being of the whole (Berry, 1987).

Meeting these four criteria of ecological sustainability is extremely challenging. Almost no existing technology satisfies them all. We can buy time, in particular respecting renewable resources, by reducing the overall human population, adopting strong forms of voluntary simplicity, and thence reducing the scale of the economy relative to the ecosphere. But our aim must be to fashion a culture that lives harmoniously within these four criteria. We have no choice. Each criterion represents one or another non-negotiable law of nature. We cannot defy them any more than we can cancel gravity. Therefore, any technology, new or existing, that we bring into the discernment process of our mindfulness practice must satisfy these four ecological criteria for sustainability or it will not pass the test for inclusion in a culture of mindful sufficiency. Realistically, it is probably impossible to conserve the advantages of an advanced civilization without compromising these criteria to some degree. But our aim must always be to work hard to find the least damaging compromise and always to replace the compromise with a less damaging one as soon as better technology becomes available. And we must always remain conscious of the fact that with each compromise we make, we push against immovable laws of nature which always has consequences (effects), sometimes unforeseeable, and sometimes even difficult for humans to perceive given our natural and technical equipment for registering change in the world.

A significant contribution in this regard has been made by the Union of Concerned Scientists to the issue of how individual consumption choices can contribute to, or help reduce, ecological impact, and with it, a variety of related health and well-being consequences (Brower & Leon, 1999). While Brower and Leon (1999) specifically discount voluntary simplicity as a

viable socio-cultural alternative to consumerism, they go on to do the simplicity movement a great service by helping to establish an empirical basis for ranking which human activities have the most impact on ecological footprint. Their research indicates three clear areas where the "technology" of simplicity should concentrate its developmental efforts: (a) transportation, (b) food production, (c) household operations and community planning. Clearly, there are linkages among these three areas, but based on their research, the ecological practice of simple living would imply a mostly pedestrian or mass transit solution to transportation needs, an organic, locally produced vegetarian or vegan diet, and a much more intensive and efficient approach to urban design than is current today—probably something closer to the leading edge work being done by Paolo Soleri at Arcosanti (Soleri, accessed 2012). The Arcosanti experiment has demonstrated that by changing settlement designs, the need for transportation can be drastically reduced or eliminated and food production can be partly integrated with housing and manufacturing activities. This more integrated approach to human settlements also happily results in a slower-paced life which is simpler and highly conducive to mindfulness. Our current approach to settlement design, and particularly the persistence of suburbs, virtually assures a rushed, automobile-dependent, and high consumption way of life—things which simply won't be sustainable in a carbon-constrained future. Thus one important step in the direction of simpler living will be not to fan out into rural areas seeking a renewal of 19th century agrarian culture, but just the reverse: the construction of high density, compact, and automobile free urban centers that are beautiful, healthy, self-reliant and rewarding places to live.

### 6. SOCIAL CRITERIA

Taking up the question of what might be the social criteria that a technology would have to satisfy in a culture of mindful sufficiency is a more complicated and contentious question than that of ecological sustainability. Regardless of what they are, however, we must remain ever aware of the fact that a sustainable culture must in every way satisfy the criteria of ecological sustainability in order to thrive. Consumer culture violates ecological sustainability mainly through its economy because it's an intensely materialistic and growth-oriented way of life. But as mentioned above in the Easter Island example, even if we forego the pursuit of affluence in favor of something else—wisdom, say, or happiness—we must always pursue these using technology which conforms with the ecological limits available to us. When our technological desires contradict planetary limits, it's the desires that must evolve, not indulging the delusion that we can somehow ignore planetary limits.

There seems to be some consensus on some of the social criteria that a technology serving a culture of mindful sufficiency would need to meet and I will review these first. Following are some "miscellaneous" criteria which I think are equally important but less often mentioned in the sustainability literature.

## 6.1. Will this technology meet human needs (economic, social, intellectual, material, aesthetic, spiritual) more equitably within and between countries, human generations, and species?

The concept of "equity" is complex but suffice it that equity is not exactly the same thing as direct equivalency since equity recognizes differences in needs whereas equivalency does not. But there is a general recognition that substantial equality of incomes can reduce both social conflict and ill health (Smith, 1996). Equity strengthens the cooperative engagement of everyone in society needed to meet truly momentous collective challenges. Greater equity in the sharing the primary productive capacity of the planet between human beings and other species

would assure their access to the resources they need to sustain their own lives with possible long-term benefits for people as well (Wackernagel (et al.), 2002: 9266-9271). A more equitable level of consumption practiced by the current generation can help future generations avoid unacceptably high "opportunity costs" incurred because of their ancestors' over-consumption (Daly, 1995). More equitable opportunities to participate in decision-making, including decisions respecting what technologies to adopt, can help avoid patterns of development that promote the interests or reflect the values of privileged elites while demoting and prejudicially marginalizing the values of the poor, women, and social minorities (Mies & Bennholdt-Thomsen, 1999). Equity may sound like an altruistic luxury unaffordable for those who believe that life is pervaded by scarcity and competition. But behaving in equitable ways is the form that enlightened self-interest takes when our perception is transformed through mindfulness practice which reveals the deep interdependence and connectedness that pervades the universe. Technologies which, either by design or unintended consequence, systematically promote equity in the world also will systematically promote sustainability.

## 6.2. Are the effects that this technology is likely to have perverse to the level of human population necessary for sustainability?

Many authorities on sustainability recognize that over-population is a key factor threatening the future of any civilized way of life. Clearly, consumption levels are inequitable within our current population. Growth in population promises only to aggravate both inequality and environmental impacts. There is also general agreement that it would be a good thing for the Earth's entire living community if the population of humans ceased growing and indeed, could achieve a substantial, non-violent and equitable reduction to a level around 1-1.5 billion worldwide—considerably below its current 7.0 billion. Population multiplied by the efficiency of prevailing Technology, multiplied by some measure of Consumption expectations is seen as a function predictive of environmental "Load" or the demand being placed on the Earth's carrying capacity for our species (Wackernagel & Rees, 1995). Thus any technology being interrogated from the perspective of a culture of mindful sufficiency would need to demonstrate that its adoption would not be perverse in some way to promoting a sustainable level of human population.

### 6.3. Are the effects that this technology is likely to have consistent with the promotion of holistic health?

Ever since Rachel Carson published Silent Spring in 1962, we have been sensitized to the potential impacts of industrial pollutants on human health as well as the health of other species. But by introducing this criterion, I mean to refer to holistic health, that is, wellness in its full array of meanings including absence of physical disease or disability, to be sure, but also psychological, social, spiritual, intellectual and economic well-being. A technical introduction should not make people or other beings sick—in any way. Technology should not be corrosive to the moral fabric of society. Technology should not intensify social conflict and anxiety by promoting the welfare of some at the expense of others. It should not addict us or socially

<sup>6</sup> Among his "bio-physical and ethico-social limits to growth" economist Herman Daly has observed: "The desirability of growth is limited by the corrosive effects on moral capital of the very attitudes that foster

growth, e.g., glorification of self interest and the technocratic-reductionistic world view." (Daly, 1995).

17

<sup>&</sup>lt;sup>7</sup> Also see Daly, 1995: "The desirability of aggregate growth is limited by its self-canceling effects on individual welfare. i.e., aggregate growth cannot possibly make all people richer than all other people. Relative improvement is a zero sum game in the aggregate."

isolate us or promote a sedentary lifestyle so extreme that it drives other physical and emotional disease processes (Alexander, 2001). It should not create benefits for us which are bought by externalizing the costs of the technology to other species or future generations.

## 6.4. Has this technology arisen from a participatory design and review process in which the interests of all parties affected by the technology have been represented and protected, including those of non-human species?

This criterion is formulated to reflect the broad concern that many technologies have been developed without due regard for their impact on others. This may take the form of inequitable sharing of benefits, or of risks, or of costs, or inequities in whose values are being promoted by the technology at the expense of someone else's values. The value of "participation" is multifaceted in that it is believed often to contribute to better design solutions (Orr, 1999), to help assure that technical introductions will be work-enhancing rather than labour-replacing (Schumacher, 1973), that development promotes our collective interest in preserving the global commons (Wackernagel & Rees, 1995), and that technologies help promote retention of local control over the means of subsistence as well as enhancing synergies among people and between people and nature (Mies & Bennholdt-Thomsen, 1999). Implementing technical innovations without a participatory process not only leaves significant parts of the community feeling bypassed and therefore alienated from the development, it may fail to include potentially game-changing input based on local knowledge of opportunities and constraints that might help assure the success of the introduction. Therefore, any technology being interrogated from the perspective of mindful sufficiency must arise from or be subject to a participatory development and evaluation process, about which I will say more below.

So far, I have proposed four key tests that any technology needs to pass if it is likely to contribute to a culture of mindful sufficiency: (a) equity; (b) promoting population control; (c) promoting holistic health; and (d) arising from a participatory design process. In addition to these, I would like to introduce a somewhat longer list of other criteria, but with less documentation and explanation than the previous four. I hope that their relevance to a technical evaluation process from the perspective of mindfulness is self-evident:

### 6.5. Will this technology promote non-violence?

Clearly, any culture which places mindfulness of interdependence among its most central guiding insights will be anxious to promote technologies that are non-violent to the greatest practicable degree. Humans by nature are heterotrophs, meaning that we must consume other organisms to sustain our lives. While we are not free with respect to needing to consumer to live, we are most decidedly free not to live to consume. We may therefore impose on our technology the ineluctable requirement to minimize elective violence whenever we can.

### 6.6. Will this technology promote development and maintenance of mindfulness?

Clearly, any culture that values mindfulness would want to configure its technology as much as possible so as to promote mindfulness, and to offer as few distractions as possible from a mindful way of life.

### 6.7. Will this technology be beautiful and/or promote the conservation of beauty?

Many of the technical artifacts of consumer culture are hideously ugly. Some of this defacement of the planet is unavoidable. But beauty is essential to a healthy soul and a humane existence. In

consumer culture, beauty is reserved for the gated enclaves and private preserves of the wealthy. In a culture broadly committed to sustainability however, efforts would be made to design beautiful things for everyone to use and enjoy. This does not necessarily entail the use of exotic or expensive materials, because beauty is not simply a function of "decoration" or elaborate display. Quite the contrary: Beauty arises from good design and good design is almost always consistent with sustainability.

## 6.8. Will this technology promote the development of intellectual wealth broadly in society, or is it likely to sequester information under the control of a few?

In consumer culture and regimes of globalized corporate ownership, a growing proportion of human knowledge is proprietary and "protected" by intellectual property statutes and treaties. This arrangement is broadly beneficial to corporate interests in that it can enhance profits by depriving others of access to technical information. But it violates the original intent behind the invention of patent law—generally to help assure a reasonable level of protection to individual inventors of their livelihoods whose innovations were routinely stolen in the 18th and 19th centuries. Today, intellectual property rights regulations slow the pace of research and discovery, contribute to monopoly capitalism, vastly increase the cost of healthcare by making patented medicines inaccessible for decades, and allow agro-chemical companies to marginalize organic producers and independent farmers from saving and sharing their own seeds. Such practices are prejudicial to the discovery of new knowledge, to social and economic equity, and to local self-reliance all of which are essential for a sustainable culture.

### 6.9. Does this technology inflame desire or generate additional needs for people?

Is it something that requires the creation of a market by artificial means or additional effort, or is it responding to an authentic need? In other discussions about mindfulness, I've tried to demonstrate that it is not trying to satiate desires that promotes human well-being, but reducing desire itself. Any culture intent on sustainability and the promotion of human well-being would find it highly irrational to deliberately develop technology that inflames desire, creates artificial needs or fosters addictions when we have enough of a challenge managing the desires we're born with. It makes perfect sense to create markets for goods no one really needs if your aim is generating profits. It is an irrational and self-defeating occupation if your aim is sustainability and happiness.

## 6.10 Is this technology something that is worthy of the trust that our ancestors placed in us to continue the human experiment?

This criterion encourages us to bear in mind the trust we carry from the past as well as the responsibility we have for the future. What would Great-grandma think if we build this thing? Is this technology leading toward a society of the sort our ancestors fought and died and suffered and sacrificed for us to live in? While many are today cynical enough to scoff at the notion that we might ever be answerable to our ancestors for the decisions we make, the insights arising from mindfulness practice reveal a different sort of universe. Nothing is lost; nothing forgotten. Our relationships with others cross time just as they do space. The voices and dreams of our ancestors are inwardly present and available to us. Anyone who takes the time to listen steadily with inward directed attention will hear them.

I've proposed ten social criteria we can use to interrogate technology concerning its consistency with a culture of mindful sufficiency. There are probably many more which I will leave to the

efforts of others to identify and discuss. I noted above that no culture of mindful sufficiency could flourish using technology that violates the essential requirements for ecological sustainability. Likewise, I would suggest that no culture of mindful sufficiency can thrive if its technology violates the social criteria I've outlined as well. Admittedly, it's easier to imagine a culture tearing itself apart because of inequity than it is if the same culture is pictured betraying the historical trust of its ancestors. So some of these criteria probably make a more directly causal contribution to a sustainable culture than others. I hope that what is and isn't most essential to the vision I'm trying to share here will, through considered debate and discussion, eventually become clear. For now, we should take up the question of the economic criteria that a technology should meet to satisfy the requirements of a culture of mindful sufficiency.

### 7. ECONOMIC CRITERIA

The economy is a system that must operate within both the parameters set by the laws of nature and by the ecosphere, and by social criteria for sustainability. While every society must have an economy of some sort, there is no reason to believe that a market capitalist economy of the sort that now dominates the world is the penultimate development. Market capitalism gets rave reviews from economists and the affluent minorities of developed countries, i.e., from those whom the system currently benefits. Its global dominance may be attributed at least as much to the fact that it is the last system standing after the Cold War slug-fest of the 1950s-80s as to any intrinsic virtues of its own. But market capitalism with its ravenous growth dynamics and the glaring income inequities it creates is clearly neither ecologically nor socially sustainable over the long run. Moreover, in any economy of mindful sufficiency, economics serves society, and no attempt would be made as is currently popular, to use economic principles to "manage" either society or the ecosphere. This would be like trying to force all the functions of the human body to conform to the rules governing a liver or a kidney. Even if such rules were perfectly well understood—a claim we can scarcely make for economics—they would still be inadequate for the management of much larger and clearly superordinate systems—the cultural and environmental ecology of human society.

It's also necessary to assure that we are framing the following discussion properly. We are searching for economic criteria by which we can interrogate technology for its consistency with a culture of mindful sufficiency. This is a somewhat limited project and doesn't amount to an attempt to design an alternate economic system, no matter how desirable that might be.

Herman Daly (1995) has already pointed out that for an economy to be sustainable, it must be subject to two sets of constraints which do not arise from any of the self-regulating mechanisms of markets. Limits on the scale of the economy must be established based on scientific observation of the ecosphere. Limits on distribution of benefits produced by the economy must be established according to socio-ethical norms. The same might be said for technology. With the exception of the proportion of the resources, space and net primary production which should be left available for the use of other species, limits on scale have already been effectively addressed by the ecological criteria mentioned above. What remains are the socio-ethical considerations arising from mindfulness and valuing sufficiency that may have relevance to technology.

## 7.1. Will this technology help to meet real needs while incurring a reduced demand for resources, energy and human labour?

This criterion is intended to reflect the value of leisure, that leisure is required for the cultivation and maintenance of mindfulness, and to pursue the intrinsic sources of well-being

which are given priority in a mindful way of life. It also reflects the desire for ecological efficiency in meeting human material needs. The purpose of technology within such a culture thus becomes that of making the economy more efficient in delivering what is needed for a life of mindful sufficiency, but always at a diminishing demand for resources, energy, and human labour. The purpose of the economy under such a regime is to provision material needs, not generate monetary riches for shareholders in the first instance. Technology in such a system is intended to liberate both people and the ecosphere from excessive through-put of materials and energy in meeting the material needs of society. "Work" is more driven by motives which arise from mindfulness and is less driven by material needs or the compulsive pursuit of profit.

## 7.2. Will this technology enhance human well-being, and particularly, the quality of the work experience of the people using it?

I have drawn heavily on E. F. Schumacher's insightful work Small Is Beautiful in writing this essay and want to reference him one more time in relation to the role technology plays in work. Schumacher proposes that work has three purposes: "...to give a [person] a chance to utilize and develop [his / her] faculties; to enable [him / her] to overcome [his / her] ego-centeredness by joining with other people in a common task; and to bring forth the goods and services needed for a becoming existence (Schumacher, 1973: 39)." From this perspective, work is an activity that promotes community, development of character, and sustenance of livelihood, not solely or primarily profit. While production enterprises must be profitable to be sustainable (must create more ecological and social value than it destroys), this is not the same thing as supposing that profit is the single "bottom line" in relation to which every other value must find its relative place. On the contrary, if work is a means of personal and community development, then it can never be eliminated without also eliminating these ways of perfecting oneself as a person and a neighbour. Well-designed tools make the activities of work safer, easier and more pleasant. Automated machinery, by replacing human workers and over simplifying the tasks of those who cannot be replaced, essentially destroys these values. Since the development of character, the skills necessary for a healthy self-reliance, and community solidarity and cooperation are all values prized in a culture of mindful sufficiency, technology that enhances these values would be adopted and technologies that undermine them would probably be avoided or discarded.

### 7.3. Can this technology operate on current sunlight?

It's now generally recognized even by the petroleum industry itself that our endowment of fossil fuels is limited and will eventually be exhausted, probably sooner rather than later. Even burning remaining proven reserves promises to contribute to climate changes the effects of which are already impacting human societies. Unless a breakthrough is achieved in fusion technology (which seems to have been "40 years away" for at least the last fifty years), we face equally inflexible limits in the supply of uranium for fission reactors as well—enough to meet world energy demand for only a few decades if uranium became the primary fuel for the global economy (Wikipedia (b), 2011). As is often pointed out, the only reliable long-term source of energy is the sun and any culture aiming to sustain itself over the long-term must be powered by current solar energy.

## 7.4. Does this technology return a real benefit to the material economy (well-being) or is it something that generates only a monetary increase (riches)?

A number of thinkers and social commentators have noted our deplorable tendency to mistake a symbol representing something for the thing itself (Daly, 1995; Dominguez & Robin, 1992;

Rayen, 1995). Nowhere in consumer culture is this more common than in relation to money. A culture of mindful sufficiency would include exercises that help people toward clear awareness of the difference between a hand full of money and actual food, or shelter, or clothing, or a transportation service. So mesmerized are we by the conflation of money with the material things it can be exchanged for, that we look to money for security rather than intact and productive ecosystems; we look to money for a good life rather than the quality of our friendships and family relations; we think an increase in our portfolio values will secure our future more surely than cultivating equitable relationships in society. Money is an extremely useful instrument for lubricating commerce and can help effect economic transactions far more easily than was the case when pure barter and trade were our only options. Money is a psychological abstraction, an idea, rather similar to say, a centimeter. Centimeters are useful for measuring things and without them, it is fairly difficult (though not entirely impossible) to build a house. We create difficulties for ourselves however, when we let ideas become more real to us than physical realities. It makes perfect sense to most people to say, "I couldn't build a house because a bank wouldn't give me a loan." But this makes about as much sense as saying, "I need a house; lumber and carpenters are available; we have the land; but we couldn't get any centimeters (Watts, d. 1973)." The insights and clarity of consciousness that is cultivated during mindfulness practice can help disentangle illusions like this and liberate us from their almost hypnotic influence.

Sustainability requires that we notice different things about our experience. Governments and businesses are obsessed with the price of things to the prejudice of noticing what is happening to them in physical reality. The Earth notices physical realities. Earth really doesn't care how much we spend on anything, but she certainly cares and notices how much material and energy is being cycled through the human economy. It is these "through-puts" of energy and matter that we need to attend to if sustainability is our aim. Having money is just as useful as having centimeters, depending on what we want to do. But Earth cares about the lumber we're buying and measuring and how many trees died to provide it. A culture of mindful sufficiency would pay attention to this too and assure that all its technology could pass a similar test.

## 7.5. Will this technology be likely to contribute to local / regional self-reliance and self-provisioning, or does it encourage dependency on transportation and distant sources of supply?

This criterion posits that despite the economic advantages of globalization and the technology that supports it, such an economy may not be socially or ecologically efficient. If our concern is sufficiency, not affluence, and strengthening networks of local, face-to-face relationships, minimizing the environmental impacts of transportation, and keeping principles of equity and economic justice in view because we want to honor the interdependencies we perceive, then a more locally self-reliant economy is preferable to a globalized one. Technologies that are useful to a more localized economy would probably be more consistent with a culture of mindful sufficiency. Such a choice will not maximize economic efficiency, but as I pointed out above, "the economy" now tends to confuse what is monetarily profitable with efficient provision of "use values." An economy that attended more closely to use values (the material reality of things and how much use they are to us), might be less monetarily profitable, but it could serve real human needs much more efficiently and in greater synergy with the ecosphere.

It is likely that more economic criteria for evaluation of technology could be framed, but the five I have already mentioned should be sufficient to illustrate the principle. Thus I envision an essentially contemplative process that would compare the characteristics and claims made by proponents of a new or existing technology against the criteria we have been discussing to

discern their alignment with the values and worldview of a culture of mindful sufficiency. There remains the question of just how this process might work, and who would carry it out?

### 7.6. Who Dreamed Up This Thing Anyway?

I'm sure that all readers can think of many examples from their own experience of having to purchase or adapt to technological devices, "upgrades" and improvements they never asked for or even wanted. "Progress," far from being a steady improvement in our well-being, has become a dizzying and increasingly involuntary experience of adjusting to changes that seem to be hatched in the shadows like Orcs in caves. Who dreams this stuff up anyway, and who is watch-dogging them?

The worldview of consumer culture, heavily influenced by laissez-faire capitalism, favors the fantasy that innovations are brought to us by backyard inventors who hatch ideas and bring them to market in pursuit of the Horatio Alger myth of the self-made millionaire. This is true in just enough cases to keep the myth alive. But the vast majority of new technology these days is invented by teams of scientists and engineers working for corporations. The technology they develop is mostly shrouded in "proprietary" secrecy until designs are submitted for patents and products are unveiled for sale to the public. Apart from minimalist licensing and safety testing requirements, the creators of technical innovations are accountable to no one except "the market." Which technologies get adopted and which disappear is something decided in a process of natural selection that would have made Darwin proud. The actual agent of selection is the individual consumer. The entire system operates on the assumption that individual consumers are sovereign in their consumption choices and as little as possible should be done to constrain that freedom, though corporations certainly aim to influence those decisions through advertising and other incentives. What people want is inferred from what they are willing to buy, but this is always a post hoc process often following the introduction of things no one has asked for. Thus we conclude that what people wanted is what they bought, and therefore the technology they will buy is the technology that "should" exist. Of course missing from this minuet is any comparison of what the market likes with the superordinate criteria of what the planet can stand to have around. Mindfulness of the life of the whole gets lost in the fog of individuals in hot pursuit of pleasure and prestige.

I have already suggested that a culture of mindful sufficiency might include some organ, probably institutional, that could apply to decisions about the development or retention of technologies a process of mindful discernment guided by the evaluation criteria I proposed above. I imagine this process happening well in advance of the introduction of such technologies to the open market. To some this will sound like a "socialist" plot to subordinate consumer choice to a hidden green agenda. To this I can only say my agenda is definitely green but it is not hidden. In fact, all of our consumer choices are already subordinated to the corporate agendas of profit maximization and consumption maximization through designed obsolescence. Libertarians who think consumer culture offers them the "freedom" to purchase whatever they like should just try to purchase foods free of chemical additives and genetically modified ingredients, or non-polluting forms of transportation, or environmentally safe cleaning products, or affordable access to natural places which offer silence and solitude, or homes with enough privacy to allow having sex on the patio without your picture winding up on Google Earth.

I have participated in several "public consultation" processes over the years related to various real estate or corporate developments which sometimes involve the introduction of new technology to the community or bioregion. In every single case, these consultations have post hoc exercises. It is very clear that the proposed development has been planned and discussed behind closed doors far in advance of any consultation with the community. Licensing

processes and hearings are often "staged" in such a way as to present development projects in such small parts that few reasonable objections can be raised to the parts individually, but the entire project and all its implications are never brought before the public. Such consultations are neither really public nor consultative because the community is not really being offered a veto over a project it feels will be damaging to its well-being. Rather such exercises tend to be public information sessions to satisfy the requirement of political correctness that "you be consulted." The introduction of new products to the marketplace including prior review by "focus groups" and product testing groups is no different.

I propose an alternative to this that I think is more in alignment with the values and worldview of a culture of mindful sufficiency. Since most technical development currently occurs under corporate control and is considered proprietary, the decisions to launch new ventures are largely taken in private and do not come under public scrutiny, if at all, until licenses must be obtained to implement the technology. Yet technology has such profound impacts on overall human well-being that this sort of approach can be justified only when profit is valued more than anything else. In any society oriented around the pursuit of overall well-being, proposals to develop technologies would be subject to a meaningful multi-step public review process from the proposal stage forward.

I want to stress that this process would be engaged before technical development is undertaken, or very soon after an invention is created. There needs to be some mechanism for community review of an idea before it attracts a vested interest of venture capitalists and technical enthusiasts and paranoid security experts and intellectual property lawyers. Communities need a way of saying, "...we don't even want this idea to exist...," and the basis for taking such a position can legitimately be sourced from values other than quantitative cost-benefit analysis. We can see here a basis for communities to defend themselves against technological introductions which might promise to be very profitable, but not necessarily contributive to the community's well-being. Well-being is constituted from more ingredients than just financial prosperity.

I envision for this process the creation of community-based Development Review Panels charged with reviewing "development" proposals of all sorts, but in this case technical development. Positioning the authority of these panels at the level of communities avoids the possibly narrow or selectively informed biases we would encounter from individual "expert" reviewers. It also conserves the collective memory and knowledge of local place which is often absent from centralize authorities like national governments who try to apply one-size-fits-all policies to the diversity of local situations, ecological conditions, and cultural heritages characteristic of real life communities. Large nation-state scale entities might nevertheless provide a useful information, research, and support function to local communities as they carry out their review activities. The Development Review Panels would be authorized to issue licenses to developers of technological and other projects, as well as declining permission to proceed. The scope of these licenses would be relatively restricted to bioregions or sub-regions within them, because a technology which may not pass the tests of mindful sufficiency in one location or cultural context might pass it in another. Over the long term, this would promote regional diversification in technologies designed specifically for their bioregions and adapted to their unique conditions and opportunities—an ecologically efficient outcome. It would, of course, militate against the "economies of scale" that are offered as apologies for enormous manufacturing operations designed to provide uniform goods for mass market consumption.

Proponents of technical development will object that such a process would slow technical progress and even if it didn't, the general public is not competent or knowledgeable enough to foresee the potential benefits or judge the potential risks associated with a proposed technology.

Conversely it might be argued that technology has been evolving faster than society's ability to soberly assess its real value and to skillfully assimilate it to other important values. With the possible exception of medical innovations, most technical development is not a matter of life or death, but rather is driven by the frenzy surrounding who will profit first and most from its introduction. Slowing this process down to some degree is not likely to harm anyone. The sun will still rise in the morning whether we make one million today or two.

The aptitude of the general populace to assess the merits of proposed technical development represents some concern, though perhaps more directly related to the number of potential innovations to be reviewed as much as their associated scientific mysteries. Special commissions could be established to review particularly challenging proposals if necessary. Technical experts would certainly play significant roles in every review. Equally important however, is not only the scientific or technical knowledge that ordinary citizens may bring to such activities but precisely their lack of it. That is to say, scientific considerations are not the only important ones in living. It is exactly the power of a wider discourse here to bring into play the diversity of human feelings, intuitions, memories and commitments that may be our best guardians of overall well-being. Those who share a technical worldview very often lack a "view of the world"—as we all do. It is therefore vitally important that we consult with each other about what we plan to do, what we hope to achieve, what we may be risking, and how this particular gadget or recipe or process contributes to or may undermine all of the conditions we know to be necessary to well-being. To liberally paraphrase the philosopher David Hume, if an idea can't be explained to a barmaid, it's not a very good idea.

Correspondingly, we need to inquire to what extent cultivating well-being requires technology at all. I'm not refuting here the fact that technology, expressed in material culture, is humanity's principal means of adapting to environmental conditions, as well as transmitting culture itself. But what I do think the practice of simple living entails is mindfulness concerning whether a particular aspect of technology actually does contribute to well-being or whether its adoption and use arises merely from the enormous psychological momentum that technology seems to have in popular culture. Some applications of technology improve the human situation. But it would be invalid to then conclude that since a little technology is good thing, more of it is better in every way. I would imagine that any future society oriented toward a simpler, more sustainable way of life, would probably employ less technology overall, and different technology in many respects.

In most respects, the transition to a culture of simple and sustainable living requires no new technology at all. To think otherwise is the conceit of consumer culture's technocrats and venture capitalists. Certainly, improvements in particular technologies such as renewable energy, organic permaculture, multi-century building designs would make welcome contributions. But in general, the transition to a culture of simple living doesn't require any new inventions. Mostly what we need is less of almost everything except mindfulness, and more only of the wisdom to selectively adopt what really ennobles human existence rather than simply expanding profit. When the object of human life becomes the development of consciousness toward ever increasing well-being rather than the mere expansion of material cravings, we will find grounds enough to decide on what to keep and what to let go.

- Alcott, B. 2005. <u>"Jevons' paradox"</u>. *Ecological Economics* 2005, *54*(1), 9–21. doi:10.1016/j.ecolecon.2005.03.020.
- Alexander, B. K., 2001. 'The roots of addiction in free market society.' Canadian Centre for Policy Alternatives, Vancouver, BC.
- Beriault, R., 2005. Peak Oil and the Fate of Humanity. On-line PowerPoint Book. Accessed June 28, 2005, <a href="www.peakoilandhumanity.com">www.peakoilandhumanity.com</a> One particularly telling example of this process is the changing ratio of the "energy return on energy invested" in oil production, the EROEI ratio. As oil deposits located near markets and close to the surface are depleted over time, oil companies must seek deeper deposits of lower grade oils located farther from markets. As the resource is degraded, more units of energy must be invested to bring each unit of oil to market. The trend in EROEI ratios over time is: pre-1950, 100:1; 1970s, 30:1; 2005, 10:1; Tar sands efficiency, 4:1 (maximum) and some authorities estimate as low as 2:1.
- Berry, W., 1987. Home Economics. North Point Press, San Francisco, CA. Wendell Berry has on more than one occasion noted that human beings are tinkerers, we are fallible, and therefore, when we tinker, we must always be mindful of our fallibility and tinker at small scales, saving all the "parts" in case we forget something, which we certainly will, and eschewing giantism in our tinkering in favor of screwing up in limited ways rather than letting our errors become huge disasters. This is wisdom that should be pondered by the emerging madness of "geo-engineering".
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- Dixon, T., 2002. Tools for Environmental Management: A Practical Introduction and Guide. New Society Publisher, Gabriola Island, BC: 419.
- Dominguez, J. & Robin, V. 1992. Your Money Or Your Life:Transforming Your Relationship with Money and Achieving Financial Independence. Penguin Books, New York, N.Y.
- Environmental Health Perspectives, 27 May, 2005. <a href="http://www.latimes.com/news/science/lana-babies27may27,0,1746496.story?page=2&coll=la-home-headlines">http://www.latimes.com/news/science/lana-babies27may27,0,1746496.story?page=2&coll=la-home-headlines</a>.
- Homer-Dixon, T. F., 1996. "Environmental scarcity, mass violence, and the limits to ingenuity." Current History, 95 (604), 359-365.
- Homer-Dixon, T., 2001. The Ingenuity Gap: Facing the Economic, Environmental and Other Challenges of an Increasingly Complex and Unpredictable World. Vintage Books, Toronto, ON. One the world's technological optimists but nonetheless influential, Thomas Homer-Dixon considers the near future to be a race between gathering climate challenges and resource scarcity on the one hand and human ingenuity on the other. He places his bet on ingenuity without seriously questioning the underlying values of consumer culture, even as

his own examples suggest clearly that exponentially growing and interacting problems will soon swamp human ingenuity. Another truly delirious example of this worldview is that shared by "geo-engineers" who plan to counteract the effects of climate change by planetary scale interventions in processes like cloud formation, plankton growth in the oceans, and adjusting the levels of solar radiation reaching the Earth.

- 'Inside Facebook' at <a href="http://www.insidefacebook.com/2009/06/02/total-us-time-spent-on-facebook-up-700-in-the-last-year/">http://www.insidefacebook.com/2009/06/02/total-us-time-spent-on-facebook-up-700-in-the-last-year/</a> It is estimated, for example, that in the U. S. alone, and for the period from April 2008 to April 2009 alone, Facebook users spent 232 million hours and MySpace users 83 million hours in on-line "socializing".
- King, J. and Stabinsky, D., 1999. 'Biotechnology under globalization: The corporate expropriation of plant, animal, and microbial species.' Race and Class 1998/99, 40, 73-89.
- Mies, M., and Bennholdt-Thomsen, V., 1999. The Subsistence Perspective: Beyond the Globalized Economy. ZED Books, London, UK.
- Mooney, P. R., 1999. 'The ETC Century: Erosion, Technology Transformation and Corporate Concentration in the 21st Century.' Development Dialogue, 1-2, 21.
- Orr, D., 1999. 'The Ecology of Giving and Consuming.' In: Roger Rosenblatt (ed.) Consuming Desires: Consumption, Culture, and the Pursuit of Happiness. Island Press, Washington, D.C. Many businesses these days are involved in what David Orr has called changing the "coefficients" of sustainability problems without really addressing the systemic, structural and design issues giving rise to them. The answer to the "waste problem" is not more garbage trucks and bigger landfill operations. It involves changing product designs, materials, transportation systems, and materials recovery activities.
- Rapley, John (2002). Understanding Development: Theory and Practice in the Third World (Second Edition). Lynne Rienner Publishers, Boulder, CO, 170. Such conversations also often fail to note questions as to the feasibility of seeking technical solutions in their own right. Rapley fundamentally questions the capacity of technology to deliver what it promises when he argues:

"Nevertheless, some optimists maintain that future technological developments, or even the widespread application of existing technologies, will resolve any future problems. ... But if we apply that principle [extrapolation from past trends to the future] we see the sort of problems that lie ahead. Let us assume, for instance, that a combination of convergence and efficiency improvements applies. That is, first-world economic growth spills over into the third world, and brings with it efficiency gains that ultimately lead to the market solving, on a global scale, every environmental problem it has created. By the end of this century, it was postulated [by Julian Simon—a "cornucopian" theorist], the world would be uniformly rich, clean and healthy. Does this vision stand to reason? We can do a simple test. If we assume that the economies of the first world will continue to grow at a 3 percent annual growth rate over the next century; that the global population will stabilize at around 10 billion by 2050, with the increase coming in the third world; and that the third world countries will grow at rates that enable them to more or less converge with the first world by the end of the century, the global economy will then end up roughly 140 times greater than it is today. Now let us extrapolate from past trends in efficiency gains. The efficiency of the car, thanks to improvements in engine efficiency and a lightening of the body, generally improved by roughly a factor of four in the second half of the twentieth century, measured by fuel consumption. Evidently, past trends in efficiency gains will clearly be outstripped—they have been so far—by output increases." p. 170.

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- Renner, M., 1990. 'Converting to a Peaceful Economy.' In: Brown, L., et al., State of the World 1990: A Worldwatch Institute Report on Progress Toward a Sustainable Society. W. W. Norton & Company, New York, NY.
- Renner, M., 1995. 'Budgeting For Disarmament.' In: Brown, L., et al., State of the World 1995: A Worldwatch Institute Report on Progress Toward a Sustainable Society. W. W. Norton & Company, New York, NY.
- Robbins, J., 2003. 'Is there slavery in your chocolate?' The Food Revolution, Food Revolution website, www.foodrevolution.org/slavery\_chocolate.htm.
- Robert,, K-H; Schmidt-Bleek, B.; Aloisi de Larderel, J.; Basile, G.; Jansen, J.L.; Kuehr, R.; Price P.; Suzuki, T.; Hawken, P.; Wackernagel, M., 2002. 'Strategic sustainable development selection, design and synergies of applied tools.' Journal of Cleaner Production 2002, 10, 197-214. A theoretical model of sustainability based on the laws of nature rather than politics can be found in the oddly named "Natural Step" formulated by Swedish oncologist Karl Henrik Robert. The Natural Step (TNS) postulates four, high level, "system conditions" which must be met for any human society or culture to be sustainable: "(1) Eliminate our contribution to systematic increases in concentrations of substances from the Earth's crust. This means substituting certain minerals that are scarce in nature with others that are more abundant, using all mined materials efficiently, and systematically reducing dependence on fossil fuels; (2) Eliminate our contribution to systematic increases in concentrations of substances produced by society. This means systematically substituting certain persistent and unnatural compounds with ones that are normally abundant or break down more easily in nature, and using all substances produced by society efficiently. (3) Eliminate our contribution to the systematic physical degradation of nature through over-harvesting, introductions and other forms of modification. This means drawing resources only from well-managed eco-systems, systematically pursuing the most productive and efficient use both of those resources and land, and exercising caution in all kinds of modification of nature. (4) Contribute as much as we can to the meeting of human needs in our society and worldwide, over and above all the substitution and dematerialization measures taken in meeting the first three objectives. This means using all of our resources efficiently, fairly and responsibly so that the needs of all people on whom we have an impact, and the future needs of people who are not yet born, stand the best chance of being met." These system conditions are essentially restatements in the language of sustainability of the laws of conservation of matter and energy, the second law of thermodynamics, and the conservation of biodiversity, genetic diversity, and bio-productivity in ecosystems.
- Schumacher, E. F., 1973. 'Buddhist Economics.' In: Schumacher, E. F., 1973. Small is Beautiful: Economics as if People Mattered. Vintage Books, London, UK.
- Schwartz, B., 2004. The Paradox of Choice Why More Is Less. Harper Perennial, New York, NY. Schwartz argues that a key tenet of the good life in consumer culture is that freedom is essential to well-being. Increasing freedom amounts to increasing the choices we have among things to consume or experiences to enjoy. Thus having more choices should expand freedom which in turn should increase well-being. In fact, however, increasing options is generally stressful for people if the number of options exceeds some unspecified threshold. This stress partly depends on how important it is to a person to make the best possible choice from among the options available which is progressively more difficult to do the more options are available. Second, when many options are available and a person makes a

poor choice, it is not easy to blame the lack of choices for one's lack of satisfaction. Instead, we wind up blaming ourselves because, after all, so many choices were available that it must be our lack of skill in choice making that explains our dissatisfaction. Moreover, having made a choice, even one we are happy with, does not protect us from speculating about what we may have missed by making the selection we did, i.e., essentially obsessing about the "opportunity cost" associated with the choice we made. Thus, even when we make good choices from a wide array of possibilities, the pleasure we feel is diminished when we are preoccupied by thinking about opportunity costs. Finally, liberal societies that allow a wide array of choices in all sorts of social situations rather than prescribing roles, duties, rules and responsibilities more strictly, tend to evoke stress and depression because every situation during the day becomes a matter of choice and decision-making. This can be extremely fatiguing, contributes to depression, and feeds stress as well. Perhaps this is part of the appeal of fundamentalist movements of all sorts, especially religions, that offer strict rules of conduct for their members, hence relieving them of the stress of making all their decisions personally.

Segal, J., 1999. Graceful Simplicity: The Philosophy and Politics of the Alternative American Dream, University of California Press, Berkeley, CA, 119-158. Segal outlines an interesting debate concerning the nature of progress that occurred in the 18th century and has continued in one form or another ever since. The central question was whether there is such a thing as human progress? It turns out that it is quite difficult to demonstrate that human character has improved over the centuries, or whether we can find examples of people who are any more morally or spiritually evolved today than were Jesus or Pericles, or Socrates, or Buddha. Moreover, even given the examples of these spiritual prodigies, there seems to be little evidence that human moral development is in any way cumulative. Each person must start over again to discover wisdom and cultivate personal integrity, as did the early masters, although their life stories and teachings are indeed helpful and inspiring.

Where we do seem to discern evidence of cumulative progress, however, is in the field of science and technology. Here discoveries accumulate that allow each succeeding generation to build on the insights and sacrifices of the previous generation to attain ever more impressive results. So while improvement in human character seems to be non-cumulative and no more widespread than in ancient times, it is possible to mark a very considerable record of material and technical progress from the past which promises in principle to continue indefinitely.

The cultural effect of this conversation, however, has been essentially to abandon any serious discussion concerning the improvement of character, even in individual cases, and to focus nearly all our attention on the development of material technology. Of course individuals are here and there deeply interested and committed to self-improvement. But we must observe that this is not a major focus of attention in public discourses, political debates, or investment of public time and resources. There are publicly funded programs of scientific research and technical development but few if any such programs of research and development into expanding human happiness, virtue, or well-being. There appears to be no such thing as a "Manhattan Project" project for the human soul. Thus our collective attention, concern, and commitment has come to be almost entirely usurped by the technological project which has become entirely conflated with the human project.

Shiva, V., 1991. 'The Seed and the Spinning Wheel.' In: The Violence of the Green Revolution: Third World Agriculture, Ecology and Politics. ZED Books, London, UK, 231-264.

- Smith, G. D., 1996. 'Income inequality and mortality: why are they related?' British Medical Journal, 1996, 312, 987-988. How does the gap between rich and poor harm the health of the poor? Evidently, the psychological hardship of being low down on the social ladder has detrimental effects on people[s' health], beyond whatever effects are produced by the substandard housing, nutrition, air quality, recreational opportunities, and medical care enjoyed by the poor.
- Soleri, P. and the Consanti Foundation. www.arcosanti.org
- Tenner, E. 1996. Why Things Bite Back: Technology and the Revenge of Unintended Consequences. Alfred A. Knopf, Inc., New York, NY.
- Turner, C., 2007. The Geography of Hope: A Tour of the World We Need. Vintage Canada, Toronto, ON.
- von Boxsel, M., 2004. The Encyclopedia of Stupidity. Reaktion Books, London, UK.
- Wackernagel, M. and Rees, W., 1995. Our Ecological Footprint: Reducing Human Impact on the Earth. New Society Publishers, Gabriola Island, BC, 97-98.
- Wackernagel, M., et al. 2002. 'Tracking the ecological overshoot of the human economy.' Proceedings of the National Academy of Sciences, 2002, 99 (14), 9266-9271. The most recent measurements of the footprint of the human economy in the ecosphere clearly suggests that such activity already exceeds 120% of earth's capacity to sustain such activities. Previous ecological footprint exercises had postulated the ecological load that would be imposed if everyone on earth consumed as much as North Americans and concluded that at least three additional planets would be required to support such consumption. This scenario, however, was speculative, since everyone on earth does not in fact consume as much as North Americans, nor would this ever be the case as the footprints of people living in the tropics will be smaller due to climate factors. But until 2002, the question remained, what was the current ecological load of human activities? This has now, unfortunately, been answered.
- Watts, Alan (d. 1973) I am indebted to author, philosopher and Zen roshi, Alan Watts for this example, though I'm afraid I cannot recall which of his many insightful books it may have appeared in.
- Wikipedia, (a) 'Military Budget of the United States', http://en.wikipedia.org/wiki/Military\_budget\_of\_the\_United\_States [accessed 2012.] The military and military-related budgetary expenditures of the United States in FY 2010, for example, totaled somewhere between \$1.01 and \$1.35 trillion, and spending for the Department of Homeland Security totaled \$56.4 billion for the same period (Wikipedia, "United Department of Homeland http://en.wikipedia.org/wiki/United States Department of Homeland Security [accessed 31 May 2012.]. These budgets exceed the total military spending for the rest of the world combined.
- Wikipedia, (b) 'Peak Uranium' <a href="http://en.wikipedia.org/wiki/Peak uranium">http://en.wikipedia.org/wiki/Peak uranium</a> accessed 9 February 2011. The question of exactly how much uranium is available worldwide, how much of it can be economically extracted and converted to energy, what proportion of total energy demand can be met from nuclear sources, and when, if ever, the world will encounter a "uranium peak" are all highly contentious questions. Some authorities believe world peak uranium production was achieved in 1980-81 and production has been declining ever since. Other authorities are far more optimistic and predict thousands of years of potential supply depending on how much we are prepared to pay for it and what

level of risk society is prepared to accept. Many projected supply scenarios seem to compare known reserves to current consumption rates, thus making it appear as though many centuries of supply are available, but few scenarios seem to compare know reserves against total global demand for energy. Since energy from nuclear sources still only represents a small fraction of total energy when compared to consumption of fossil fuels, it is reasonable to infer that if nuclear energy became the world's dominant supply, reserves would be depleted far sooner than the most optimistic scenarios suggest.

Williams, P., 1973. Das Energi. Elektra Books, New York, NY., 139.

Woolman, J., 1991. 'A Plea for the Poor or A Word of Remembrance and Caution to the Rich.' In: Moulton, Philips P. (ed.) The Journal and Major Essays of John Woolman. Friends United Press, Richmond, IN. A classic example of concern for the impact of luxury consumption on human well-being is expressed by the 18th century Quaker preacher John Woolman, who argued that what was necessary for a decent life could be easily and honestly obtained, but that craving for luxuries caused plantation owners and the managers of industrial firms and trading networks to work both their employees and their animals too hard, to undertake miserable and dangerous sea voyages to Europe merely to import superfluous fashion objects and luxuries, and most troubling of all to Woolman, to support the institution of slavery and appropriation of land from aboriginal peoples.

By only slight extension we can see these same dynamics at work today when children in China and other south Asian countries are engaged to dismantle the toxic materials present in electronic wastes imported from other parts of the world, and where the continual inducements of consumer advertising entice North American consumers to overextend themselves in the use of credit—average individual consumer debt at this writing amounting to almost 1.5 times their average annual incomes.