The Shift Scenario

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It may be possible for the global system to undergo a change in state, a fundamental shift from one of increasingly intractable interrelated crises to one characterized by mutually reinforcing synergetic solutions.

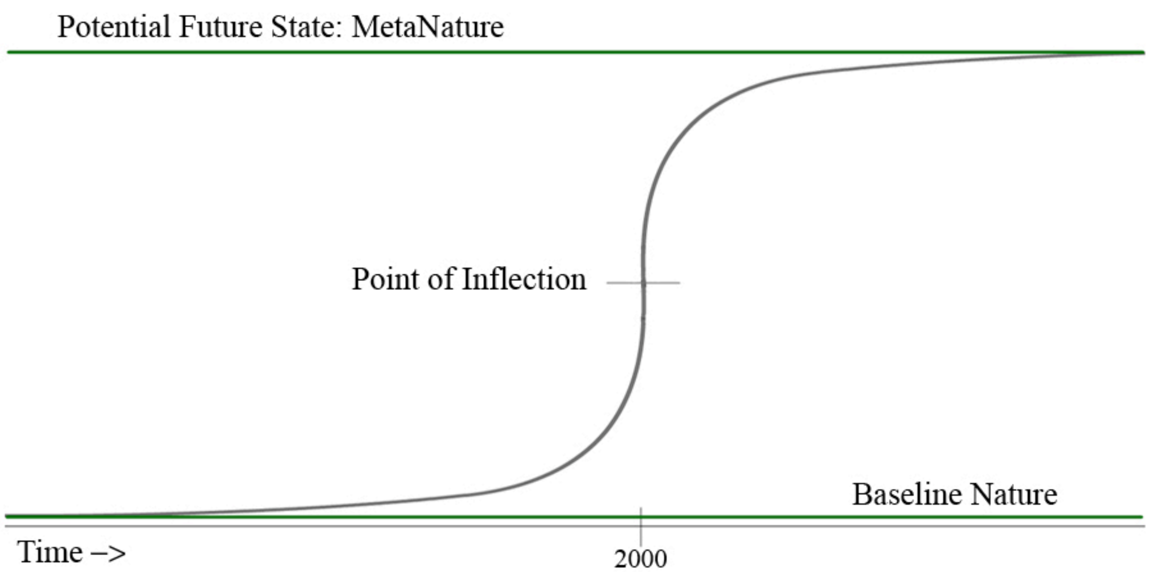
The global situation has become like a Gordian knot wherein it appears that all attempts to solve any one crisis in isolation only makes others worse. We face myriad crises, all aspects of an unprecedented breakdown in many global systems that is already coming to a head and will become acute within a decade or less. Spiraling debt, the impending end of abundant oil, global warming, overpopulation, mass extinction and a general acceleration of change verging on chaotic instability can all be seen as part of a pattern of converging indicators at a unique moment in history. Many of these trends (enumerated in more detail below) are still accelerating and are apparently characterized by logarithmic curves.

Mathematically, a "log curve" becomes ever steeper as it goes off toward infinity. When the log curve describes a finite trend such as population growth, or the rate of consumption of renewable resources, a serious problem is implied. For example, in many species such as bacteria in a Petri dish, or rabbits on an island, given a sufficient food supply the population will first spike with a growth rate following a log curve, and then crash. This overall pattern is known as the "J-curve."

It is easy to imagine how the current trajectory of our civilization could also turn out to follow a J-curve. Indeed, many analysts who have examined global trends in detail would say that a purely rational assessment of the situation indicates that we are most likely headed toward some sort of collapse or crash. Many of them might argue that the great majority of people who don't share that view are in denial, or are at best operating on blind faith. Most of those arguing that we are currently headed for catastrophe insist that the only way to avoid it would be for society to make a massive U-turn. Unfortunately, this seems exceedingly unlikely to happen.

However, there is another plausible scenario. At a critical point, key trend lines could shift from curving one way, representing ever accelerating but increasingly instable change, and cross over to begin to curve the other way, representing deceleration toward a state of greater stability. Mathematically, this phenomenon would be described as an S-curve, and the point where the curvature changes from facing one way, to facing the other, is called the "point of inflection".

At this moment of transition the trends represented by the curve are changing so rapidly that the situation feels unstable, but this point also represents the unique moment of opportunity when even the slightest shift can profoundly affect the trajectory of the whole system.



Viewed from this perspective, a whole range of trends, some usually seen as positive, and others negative, might make sense when viewed together as part of a larger phenomenon, one that is in the deepest sense hopeful, and yet also profoundly challenging. Many of these trends, described below, represent the culmination of a phase of the industrial revolution that began in the 1700's as a direct result of the scientific revolution of the 1600's. The end of that phase, reaching maturity at the cusp of the millennium, represents the inevitable shift that must occur from a system based on extractive resource use, to one characterized by closed loop cycles of material flow. As we will see, this adaptive transformation is strikingly similar to one biological nature adopted three billion years ago. A potential plateau is implied, a new dynamic stable-state analogous to an octave of nature, that could be described as MetaNature.

Challenging Global Trends

A number of global trends may be characterized by the S-curve diagram and other related graphs. Some of the most challenging phenomena include:

Population Plateau: While debate continues about exactly what the final figure will be and when it will occur, there is universal recognition that the population must stabilize in coming decades.

The larger that final figure is, the more challenging it will be for all of us. However, the acceleration of the population growth has actually reversed and began to decelerate in the 1970's. AIDS and especially other new diseases such as bird flu could also change the overall population plateau figure and when we reach that plateau.

Peak Oil: The drop off in new oil and gas discovery heralds the end of the fossil fuel age and the transition to solar and other clean renewable energy sources. Some analysts say we have already reached the top of the curve, while others say it may be as much as a few decades away. But the argument is over when, not if, it is happening now. What is not clear is how steep the other side of that curve will be, though all indications are that it will be more abrupt than many believe.

Global Warming / Climate Change: Even if we had more fossil fuel, we are running out of atmosphere faster than we are running out of oil. Coal poses an even more serious threat to increase CO2 levels, and both the U.S. and China have a lot of coal.

Mass Extinction: Biologists are already calling the current loss of biodiversity *The 6th Extinction*, as it can only be compared with the five previous periods in the history of life on Earth when meteor impacts or other cataclysmic events caused massive extinction spasms. It took hundreds of millions of years for biodiversity to re-establish itself on Earth after each of those. By contrast, humans have only been around for two million years, and civilization for a few thousand. It is very likely that all future generations will measure us by how much of the existing biodiversity we preserve for them. If current trends were allowed to continue it is estimated that we would lose half of the plants and animals on Earth within 100 years. It is also estimated that climate change alone could cause the extinction of 30% of all terrestrial plant and animal species.

Over Consumption of Resources: While many natural resources are theoretically renewable, we are currently using many of them at extremely unsustainable rates. Overall, we are currently using approximately half of the biological output of the planet for human purposes. The doubling period is on the order of ten years, and our consumption rate is still accelerating. In other words, we would be using more than all of the available output of the planet in roughly ten years, or less.

Global Markets: While debate rages as to whether free trade is in fact fair trade, for better or worse, the world is rapidly and inevitably being transformed into one unified economic system.

The negative consequences of current "globalization" have more to do with unfair biases in the fiscal and economic rules of that process, than with the fact that it is becoming one global system.

Hopeful Global Trends

At the same time we are facing these challenges a number of other trends are emerging just in time to potentially allow us to effectively address them. These include:

Transformation in Technology: Given the advances we have seen over the last 100 years it is likely that we can develop the scientific insight and technological capacity to achieve the one hundred fold increase in energy and natural resource use efficiency that will be required for the entire plateau population to enjoy a satisfactory level of material well being, support and comfort.

Information & Communication Technologies: The Internet, personal computers, cell phones, satellites, digital radio and television are all part of a revolution in digital communications, which is both enabling and driving massive changes in global culture, awareness and education.

Cross-cultural Understanding and Cross-fertilization: We are living in a unique moment of rapidly accelerated cross-cultural mixing, novelty and vitality.

Rise of Democracy: Throughout the world vast numbers of people are expressing a universal aspiration for political freedom and self-determination, often for the first time.

Growing awareness of the Interconnectedness of All Life: Catalyzed by revivified spiritual aspirations and spread through changes in communications technologies, new local grassroots movements striving to protect cultural and ecological resources are sprouting all over the globe. The image of the Earth from space symbolizes a new collective global experience marking this moment in history as different from all previous times.

Beyond The Solar Age

While many authors have pointed to the transition from the fossil fuel age to solar age, most discussions have lacked the larger context of what the dawn of the solar age actually represents in the evolutionary history of life on Earth. If we examine the industrial revolution as if it were an extension of the same natural, and indeed possibly inevitable, process of evolution that has guided biological evolution, several important and perhaps comforting themes emerge.

Peak oil and atmospheric CO_2 build up actually represent the second climate crisis and perhaps the third energy crisis in the biological history of life on Earth. The first energy crisis came when early life used up all of the freely available high-energy chemicals for food and had to suddenly invent/discover photosynthesis in order to capture and use energy from sunlight. The first climate crisis, the O_2 crisis (as in too much oxygen), came when these photosynthesizing bacteria had eventually released so much oxygen into the atmosphere that, after it had rusted all of the available iron, oxygen rapidly built up to such a concentration in the atmosphere that organisms started spontaneously combusting. In response to this dangerous new energy source available in the atmosphere new organisms invented/discovered respiration. Ever since then photosynthesizing plants and respiring animals have maintained the carbon cycle, thereby keeping the ratio of oxygen and carbon dioxide in the atmosphere in balance.

Just as early organisms virtually exhausted available resources before discovering how to establish and maintain cyclic closed loops of material flows, humans have done the same with our industrial technology. We will either figure out how to make this transition like those successful organisms that survived, or go extinct like those that did not.

Viewed in the context of the carbon cycle, all human energy combustion technologies are like hyper-animals; they are all on the respiration side of the balance between plants and animals. Like animals, our machines burn oxygen to consume hydrocarbons and give off carbon dioxide and water vapor. Actually, even human agricultural activities are biased in that direction compared to nature's previous balance, as we can see evidence that the atmosphere first began going out of balance long (in the human time scale) before the industrial revolution. Humans apparently started changing the atmospheric balance toward more CO_2 with the first large scale agriculture, beginning ten or twelve thousand years ago, as we both reduced the total amount of tree cover and increased the overall rate of burning and decay.

It is hard not to regard this trend with considerable distress, as indeed the consequences for us, just as for our ancestors the microbes, put our species under considerable evolutionary stress. Yet, seen from another perspective, what is happening to us now, may be just as natural and inevitable as what happened at the dawn of photosynthesis or respiration. Moreover, just as at those moments in evolutionary history, we have already invented/discovered a new way to arrange matter that will allow us to harvest the energy we need.

This time it is humanity's turn to perform the same kind of feat nature did millions of years ago and figure out how to capture sunlight in matter and transform it into a useful flow of energy. Now, instead of doing it with carbon, as nature did with photosynthesis, we are doing it with silicon, which is in a sense the next octave of carbon, directly below it in the same central column on the periodic table. This time, as with each of these previous evolutionary turns on the spiral, matter has arranged itself (now through humans) in a pattern that captures ten times as much of the energy from sunlight as photosynthesis. Silicon photovoltaics are an order of magnitude more efficient than plants. Granted green plants, like all biological forms in nature, solve many problems at once without any toxic or high temperature processes, and can reproduce themselves at ambient temperatures without external equipment. However, the illustration remains useful.

Silicon photovoltaics may be seen as the first example of a new class, or a new phase of human industrial artifacts, which express a level of coherence and elegance in their design approaching that found in nature. Indeed, these and other new technologies may point to a whole new class of human technologies drawn from a deep understanding of the same geometric patterns and coherence found in nature's forms and expressing the same degree of chemical elegance in their composition and resource flows. Such technology might be described as essentially like an octave of nature, as Meta-Nature, a set of solutions to the puzzle of matter as elegant as those found in nature; like nature, already existing in potential in matter, and yet composed of a realm that may not assemble itself through biology except through the intervention of humanity.

We may gain further insight into the natural trajectory of energy technology by observing that over the last few hundred years the primary fuel source for human technology has progressed from wood, to peat, to coal, to oil, to natural gas, and since 2000, has been widely recognized as inevitably converging on hydrogen. What is most interesting about this sequence is that each form of energy storage has fewer carbons in relation to hydrogen until one arrives at pure hydrogen and has nowhere left to go. With hydrogen, one has arrived at the smallest, lightest carrier for chemical potential energy possible in matter. Thus, coincident with all of the other trends described at the outset, we seem to also be arriving at some sort of inevitable logical end point in the sequence of ways in which to store chemical potential energy in matter.

The Point of Inflection in Technological and Human Transformation

Humanity may actually be on the verge of suddenly recognizing that we have just turned the corner and are already rapidly headed toward a plateau where we will have achieved clean, sustainable closed-loop very long-term solutions for our fundamental energy and life support technologies. From this perspective, the transformation of energy technology that is occurring at the end of the oil age takes on a larger meaning. Fossil fuel begins to look more like an analog of the white of an egg, an energy reserve sufficient to allow an organism to grow rapidly to a state of maturity at which point it makes a fundamental transformation to a state of sustainable self-reliance. The long-term solar-hydrogen technology will literally be born out of the nourishment of the fossil fuel age.

We may feel dismay at our apparent failure to make this transformation rapidly enough thus far. Yet, once one has glimpsed this larger perspective, it seems perhaps inevitable that, like biological organisms near the point of birth, the global system can only make the transformation necessary by going into a period of rapid growth and turbulence to achieve escape velocity. The portion of the S-curve as it traverses the point of inflection may be very steep, like a log curve going almost vertical. During the relatively brief period that the system traverses this highly accelerated and dangerous process, none of the existing systems can be sustainable because all transitional systems are appropriate only to that momentary period and are still too inefficient to retain for long after. Once we begin to come out the other side of that brief period the technology for fundamental life support needs will start to become both increasingly efficient and increasingly durable. Only efficient solutions will be appropriate to retain for the long term, and only durable solutions will be worth investing in, as the return on investment will be measured over longer and longer periods of time.

As we pass through the point of inflection, see where we must go and begin to adapt accordingly, we will discover that the technologies created during the disposable growth mode of the late 20th century were so inefficient that it will be very easy for us to suddenly make huge advances in efficiency. While these solutions will make huge strides they will still be along way from the maximum efficiency theoretically achievable. They will not even begin to contemplate the durability that will theoretically be achievable in the future. This describes the life support technologies characterized by the portion of the S-curve from the point of inflection up to the middle of the curve. This period is in a sense the inverse mirror image of the first industrial revolution and might be expected to comprise an approximately symmetrical period following the millennial fold point as the industrial revolution represented preceding it, perhaps a couple of hundred years, though it could also turn out to happen much more rapidly.

The next section of the S-curve, where it flattens as it begins to approach the horizontal asymptote representing an exceedingly stable long-term plateau, an analog or octave of nature that we are referring to as MetaNature. This plateau would be characterized by the advent of technologies that are so efficient, durable and elegant that they would be retained for generations, as each successive iteration would become increasingly difficult to improve upon. For example, a perfectly doped silicon photovoltaic panel designed and assembled at the nano-geometric scale and encapsulated in pure quartz, instead of plastic. Such technology could be expected to last a very long time, such that one could imagine humanity living with it for seven generations and beyond.

The point of inflection in the S-curve is also the point at which key individuals begin to recognize, and become aware of what is happening in the overall system and where it could be going if we successfully traverse the point of inflection. From this new perspective, it immediately becomes clear to them how their previous behavior in the absence of this new vantage point had in fact been necessary, appropriate, and perhaps even inevitable, to bring the system to its current state. But at the same time, those behaviors would now become counterproductive and even dangerous if they did not shift their actions to steer the system in a slightly different direction toward a stable long-term future. The shift necessary at his point is subtle, yet profound, as the vary recognition of the possibility of the long-term state will itself act as an attractor helping to make it self-evident to players how to adjust their behavior to bring that future into being more rapidly.

New Economic Game Rules

The most fundamental shift that would both enable and require new approaches would not involve technology so much as changes in the social-economic "game rules," which constrain and dictate virtually everyone's behavior within the current system. At some point in any discussion of a sustainable future or adaptive alternatives to our existing short-term practices the discussion turns to the constraints of the economic system and financial markets. While many economists take for granted that the existing money system is inevitable, like the laws of physics, and that no other alternative is possible. It is more accurate to regard our economic system as a human construct; a set of game rules, which are actually only maintained through carefully orchestrated efforts and have many potential variations, each with a set of likely consequences. It is an open question among some observers whether stability can be preserved in that system, and for how long. The increasingly speculative nature of the vast flows of wealth, deepening social inequity and unprecedented ecological crises will all pose serious challenges to the system. From this perspective it is quite plausible that the global monetary system could suddenly go into crisis due to its own inherent instability before anyone can intervene. Fortunately, the same innovations which could help to alleviate the myriad local economic problems racking the system now would also be most likely to help recover from a global crisis.

The current monetary system is based on “fiat” money. That is money created by fiat out of nothing based on collective trust in the system. Central banks create the money supply by lending money into existence. Thus, our money is debt-based; it comes into existence with interest attached. In addition, fiat money must, by definition, be scarce to have value and thus bring with it positive interest rates. It can be shown mathematically that positive interest necessitates short-term thinking by rapidly discounting the future. This by itself requires all players to act in an unsustainable short-term manner toward nature, and human labor.

Debt-based fiat money is very good for doing industrial revolutions. So, to the extent we have not concluded the transition from the oil age to the solar age, we may still need this kind of money for the second industrial revolution. However, it was primarily appropriate when scarce capital equipment, and to some degree human labor, were what constrained us most and natural materials were abundant. Now that the situation is inverted our continued adherence solely to debt-based money is threatening to destroy the life support capacity of the biosphere.

One approach to help gradually and smoothly shift the situation would be the introduction of a commodity-backed currency. Bernard Lietaer, designer of the Euro, proposes a trading unit called the Terra, backed by a “basket of commodities”, i.e. a bushel of wheat, a barrel of oil, an ounce of gold, etc. In many ways the Terra is simply a rationalization of the massive existing barter counter-trade already conducted between and among multinationals, in part as a hedge against currency fluctuations. But the Terra would have the advantage of being counter-cyclical. That means it would be a hedge against economic volatility: in an economic downturn companies holding excess inventories of the constituent commodities could generate liquidity by converting them into Terras, in boom times they would convert their Terras back into commodities and use them as raw materials for production. Such a system could suddenly become the safety net in case of loss of faith in fiat money in a financial meltdown, but could also potentially have other indirect benefits in helping to transform financially driven time horizons. With debt-based money the future is discounted rapidly, the interest rate is also literally called the discount rate, but with a commodity based trading currency money is no longer a good store of value, only the underlying goods themselves, and they have storage costs. Thus, the trading unit actually effectively has a negative interest rate, more like a hot potato. Under such a system as was the case in ancient Egypt and in medieval Europe when the cathedrals were built; there is a natural tendency to seek to create truly enduring stores of value.

Complementary currencies based on either mutual credit, or time dollars, are also promising for invigorating local sustainable economies, transforming social services and alleviating the health care crisis. The Japanese government has been studying complementary currencies intensively for several years as a way to avert bankruptcy in their health care system.

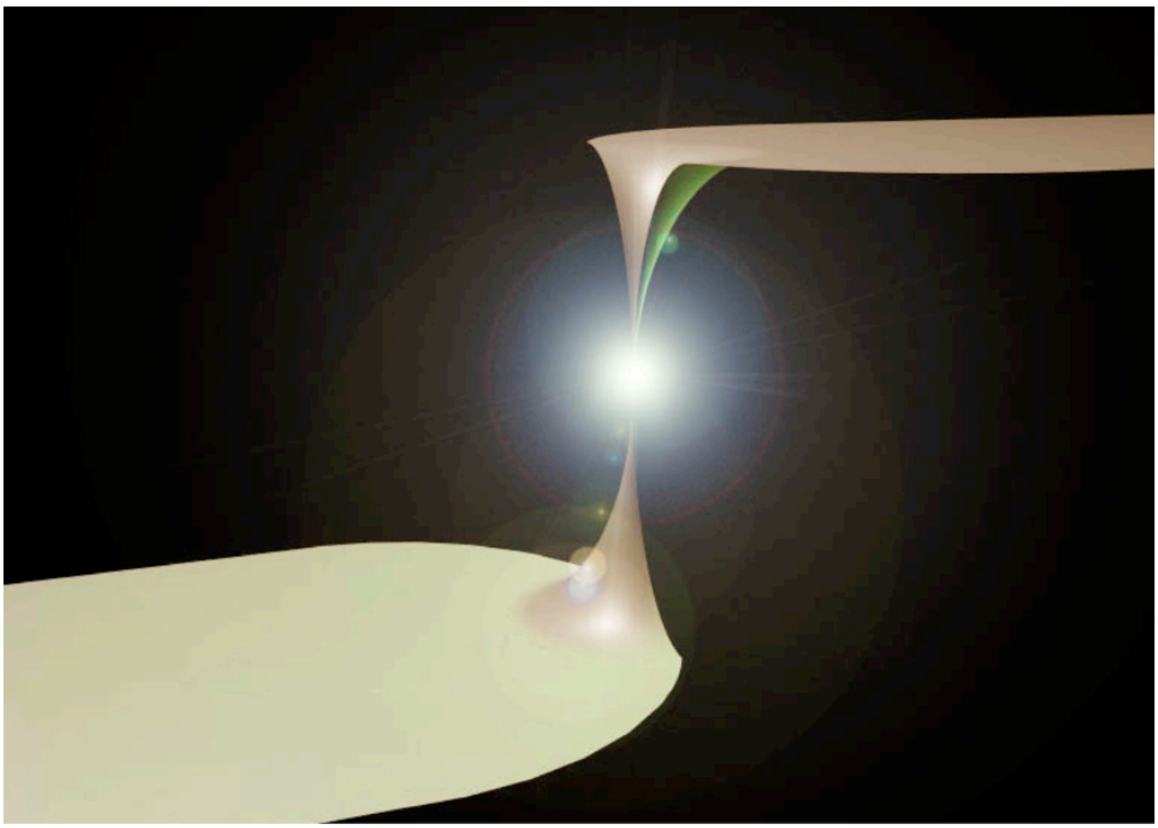
The second major source of dysfunction in our current economic system is the existence of externalities, i.e. costs which individual entities, usually corporations, are permitted to force the rest of society to absorb, rather than internalize in their own pricing and balance sheet. This systemic situation could be solved by international agreement changing the global rules of trade.

For example, a simple approach would be to phase in a new trade provision specifying that, any corporation that fails to fully account for, and internalize, all costs associated with the production and sale of their goods or services shall be responsible for a multiple of the actual cost avoided. The penalty could be imposed as an import tax. The rate might start as a tiny percentage of the avoided cost and grow steadily to 200% or more over a period of a decade. If managers knew that this cost was going to predictably increase over time they would incorporate full cost accounting into their normal operations and make investments in plant and equipment to change practices so as to avoid these penalties. All competitors within a given industry would face the same challenge, so it would not give any one company an unfair competitive advantage, though inherently dirty and costly industries would suffer in comparison to cleaner and less costly alternatives. Any company that could document that an error was made in good faith would have a valid claim against their own insurance (but might also pay higher future rates accordingly). Violations found to have been made with malice of intent would be a liability that would come directly out of shareholder equity in the company. In this manner, it becomes the responsibility of every corporation in each industry to insure that it has accounted for all costs associated with its activities. Lawyers would police the system earning lucrative settlements, at least until the system adjusted and violations became increasingly rare as executives rapidly restructured in response to shareholder pressure to avoid costly violations.

These are examples of shifts in the economic “game rules” which when coupled with a new technological revolution based on design that operates in alignment with the same underlying principles as nature might propel a tremendously vibrant transformation of the world. The most optimistic technological breakthrough, (which makes it plausible that we will be able to not only reduce, but reverse global warming in time) is a carbon sequestration/utilization technology based on charcoal. The process can use a combination of biomass with a fossil fuel source, like coal, to make ammonium bicarbonate fertilizer and hydrogen. It has been demonstrated at a small scale, and can actually remove CO2 from the air while returning carbon to the topsoil where it is needed. The same process can also be used with biomass alone to make bio-diesel and hydrogen along with the ammonium bicarbonate fertilizer. http://www.eprida.com

Many of the other technologies in question may in fact be low-tech in their implementation, but pay tremendous dividends for a global population freed from the yoke of stifling debt and given access to useful and appropriate information. Examples of these might include inexpensive bio-sand filters that allow people to gain access to cheap safe drinking water without electricity; or “swales”, contour ditches that allow people to reforest otherwise barren dessert by catching seasonal rainfall and storing it in the ground where trees can tap into it; or a host of permaculture and aquaculture techniques that can allow a peasant family to live sustainably on three hectares of spent land, rather than slashing and burning a hectare of virgin rainforest for meager subsistence every year.

The potential for all people to find a new sense of purposefulness and determination when given the mandate and the opportunity to rise to a meaningful challenge is immense. We have most often seen this in time of war when whole populations have reorganized themselves almost literally overnight. It is even more apparent in the face of natural disasters when people most selflessly pull together for the common good in the face of adversity. We have also seen it to some degree in the US with the New Deal and even the Apollo space program. It is very likely that the challenges of the coming decade will dwarf these examples and call for an even greater response, for we are entering the period of the greatest shift humanity has ever known.



In some ways the perspective outlined above is reassuring, as it suggests that even human technological activity can be seen as a natural and indeed inevitable process wherein everything that everyone has done up to this point was perhaps necessary. Evolutionary systems seem to naturally move toward higher states of coherence. Nature does this by itself, and thus what we're doing can be seen as part of a natural process. Once seen in this manner, that vary understanding also compels us to act differently in the light of this new vantage point, as we, as humans, have both a unique opportunity and responsibility to choose.