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Conservative Evolution, Sustainability, and Culture

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Abstract: In his article "Conservative Evolution, Sustainability, and Culture" Gábor Náray-Szabó argues that evolution is conservative in the sense that throughout the history of the universe old constructs like elementary particles, amino acids, and living cells remained conserved while the world evolved/evolves in complexity. A similar process can be observed in cultural evolution as components of society and culture continue to evolve. Considering the increasing pressure on natural resources by material consumption, a close alliance between past, present, and future generations is unavoidable and thus Náray-Szabó posits that concepts of conservative evolution and sustainability are related. However, in order to avoid blind alleys of evolution to be recognized easier and faster, material consumption should be reduced and instead of continuous economic growth, the increase of complexity should be sustained: the best frame for such a transition would be an ecosocial market economy tied to culture in general.

Gábor NÁRAY-SZABÓ

Conservative Evolution, Sustainability, and Culture

The extent and pace of changes which took place in the last century is unprecedented in human history. Two devastating world wars, the simultaneous existence of wealth and poverty, nuclear power, the exploration of space, the internet, cell phones, changing sexual habits, altogether new technologies, etc., signal that humankind entered an age of rapid transition. However, among the changes there is something that seems not to change: the need for safety and predictability. This makes both voters and elected politicians aversive to formulating long-term projects implementing essential changes in everyday life: instead, business-as-usual scenarios are most popular. Accordingly, even if severe threats can be foreseen, necessary measures almost always fail because short-term disadvantages overweigh long-term and less predictable benefits. Environmental policies are therefore often influenced by local or short-term interests or as a counterbalance extremist views and the notion of "sustainability" dominates the media and public discourse without long-term views.

In this study I present an overview on some threats to modern society such as pollution and climate change within the context of a generalized concept of evolution. I call attention to the conservative aspects of evolution and stress the importance of a transformation from material to non-material consumption. Such a transformation is indispensable while problematic because the status quo must change. A variety of alarming signals ranging from local to global pollution, climate change to fiscal crises should call the attention of decision-makers, as well as the public to the fact that things are going wrong. One of the first who described the discrepancy between environment and material production was Rachel Carson in her 1962 *Silent Spring* in which she argued that the uncontrolled use of the pesticide DDT was harming birds. In response to the publication of the book, DDT use was banned by the U.S. government. However, Carson's statements have been continuously criticized over the last decades and came under severe attack from various authors (see Stoll). The claim was that restrictions on DDT have caused millions of human deaths indirectly by preventing its use to combat malaria through the killing of infected mosquitoes. Others argued that the insects gradually developed resistance toward DDT and that therefore the pesticide had to be used in larger and larger amounts leading to increased pollution (see Stoll). Five decades of debate brought up a variety of arguments for and against Carson's premise indicating that the issue is complex and no simple solution can be found.

While the poisoning effect of DDT can be considered as a "local affair," the formation of the so-called Great Pacific Garbage Patch from plastic waste has a severe regional impact (see Dautel). Estimations of its size range from 700,000 to more than 15,000,000 square kms, 0.4% to 8.1% of the area of the Pacific Ocean. Shocking photographs of birds immobilized by plastic bags prove that these garbage deposits built up by thousands of vessels emptying unlawfully their waste cargo to the sea is a deadly threat to animals. Its gradual decomposition leads to the emission of acid and other harmful chemicals, poisoning the water on a large scale. As the production of plastics increases and recycling is more expensive than simple deposition to the sea, it is most probable that the size of the patch will continue to grow in the near future. Another global trend causing major concern is climate change probably induced by the increased carbon dioxide emissions owing to economic activity. In the last decade the carbon dioxide concentration of the atmosphere has increased at a pace not detected in the past half million years' history of the earth. The heat-trapping (greenhouse) effect of carbon dioxide released by industrial production has led to an increase of 0.6 Celsius of global temperature since 1970. Arctic sea ice has halved between 1996 and 2012, while the ice mass on Antarctica has been reduced by more than 1000 gigatons since 2006. As a result, a rise in sea level has been detected at 200mm since 1870 and 70mm since 1994 (see "Global" <http://climate.nasa.gov/key_indicators>.)

Besides local and global pollution, concerns about the exhaustion of renewable and non-renewable raw material resources are discussed both by experts and in public discourse. For example, during the last fifty years the world's irrigated areas have tripled, which is historically unique. Countries such as China, India, and the United States, which host almost half of the world's population, are overusing their aquifers and this has a negative effect on grain production. Countries of the Arab world, and Iran, Mexico, and Pakistan are near or beyond peak water, which may lead to catastrophic consequences in the near future (see Brown <http://www.theguardian.com/global-

development/2013/jul/06/water-supplies-shrinking-threat-to-food>). The world has maneuvered itself into a situation where water, not land, has emerged as the principal constraint on food production. Some argue that peak oil can be considerably shifted because of the exhaustion of shelf oil, which already led to a reduction of prices (see Morgan). However, the technology used for the abstraction of shelf oil needs much water. Thus shifting peak oil brings peak water closer. Further, the global financial crisis of 2007-2008 forced millions all over the world to think over the sustainability of present-day practices of the economy. Some of the world's largest financial institutions went bankrupt and disappearing market confidence caused severe losses to investors as the financial bubble based on virtual money instead of real production collapsed. This financial crisis will probably be followed by others owing to pollution, global warming, and the shortage of raw materials.

It is clear that if we want to avoid a series of crises or at least reduce their impact, we have to find and follow a new paradigm. Although several propositions appeared in the last decades for temporary solutions, no global views have been accepted to date. My argumentation is based on the generalized concept of evolution and I think that a new paradigm could be embedded in this general concept if we develop ideas on long-term sustainability. I do not consider evolution in the strict biological sense; rather, I speak generally about a gradual, spontaneous process in which a structure composed of elementary particles, molecules, living cells and organisms, symbols or behavioral patterns, transforms into a different and usually more complex form. In general, this means that the new form fits better into a given environment than the earlier ones, i.e., it proves to be more durable — either in its concrete existence or in its type — than its alternatives. Thus, either its own individual being becomes permanent or the production of similar forms becomes continuous. This evolutionary process increases the complexity of a certain region in the long term while this complexity may remain constant or decrease in other regions. Spontaneity means here that the whole structure is not a conscious human constitution, although some components of the structure may arise through human planning. The concept can be traced back to Herbert Spencer, who argued that all structures in the universe develop from a simple, undifferentiated, homogeneity to a complex, differentiated heterogeneity while accompanied by a process of greater integration of differentiated parts. In Pierre Teilhard de Chardin's formulation, "Historically, the Universe concentrates in more and more organized forms of matter" (44; unless indicated otherwise, all translations are mine).

By the term "organized forms of matter," I mean complexity and by "evolution" I mean the long-term increase in the complexity of a given system. It is not easy to find an appropriate mathematical definition of complexity and a general one which is close to the notion of Spencer on greater integration of the differentiated parts has been formulated by Todd LaPorte. According to LaPorte, complexity is determined by the number of components, as well as the degree of their integration and differentiation. According to this definition, for example, a research team is a simpler entity than the city of New York with ten million inhabitants, myriads of organizations, and a sophisticated physical infrastructure. Clearly, the definition can be generalized to apply to other systems such as living organisms. Using said definition of complexity, I posit that it is possible to extend the concept of biological evolution to the whole history of the universe. According to the second law of thermodynamics in a closed system, the amount of disorder (entropy) spontaneously increases (see Bertalanffy). This also leads to decreasing complexity in the long term and on average. Even if this statement remains valid for the whole universe and that can be open or closed, complexity may increase in restricted regions at the expense of a yet greater net increase in disorder elsewhere. Over time, long-term increase in complexity can be observed. Clearly this observation was not possible when humans did not yet exist, however, based on a variety of recent observations and indirect, but convincing scientific conclusions, the continuous emergence of more complex systems can be acknowledged. After the Big Bang, individual elementary particles appeared which associated to form more complex atoms and molecules, stars, and planets. In light of the LaPorte definition, we may call a planetary system more complex than an isolated star since it contains more components with a degree of integration (gravitation) and differentiation (varying size and distance from the central star), which is higher than that attributed to a lonely star. As time passed, the solar system with earth as one of its planets appeared and owing to special conditions, a manifold of chemical molecules has been formed and organized into more complex biological polymers, which in turn allowed the emergence of life.

Theories of biological evolution are based on the principle of natural selection as formulated by Charles Darwin. Organisms reproduce with only small changes between generations; therefore species had been changing for a very long time. Biological evolution also involves the increase of complexity on the long term (see Bonner; McShea). Vertebrates are more complex than living cells and the human organism is the most complex system among vertebrates. Groups formed by humans are more complex than individuals and information society exceeds previous communities with previous levels of communication and culture. This observation does not mean that we consider the increase of complexity as a contradiction to Darwinism: both concepts can be harmonized (see Bonner). Further, during the long history of biological evolution, in some specific cases complexity did not increase, but rather decreased (see McShea). While some traits may spread through a population reducing the fitness of the individuals who bear them, this still allows for the long-term increase of complexity. We do not have enough information to decide whether complexity will or will not increase perpetually; however, the series of events since the Big Bang can be put into a logical order leading to the conclusion that during several billion years from an undifferentiated, homogeneous singularity to a complex system the biosphere of earth emerged.

Spencer and his successors generalized the concept of biological evolution in human society. The notion of survival of the fittest, as applied to social systems, initiated the formulation of social Darwinism at the end of the nineteenth century. Social Darwinists consider struggle to be a factor in the improvement of a community: "war has been the chief and leading condition of human progress" (Ward 238). This concept, resulting in imperialism, racism, colonialism, cultural essentialism, etc., is rejected in most democratic societies although of course in the last two centuries we have had exceptions such as nazism and communism, as well as the persistence of fundamentalism and essentialism of various types (see, e.g., Hofstadter; Leonard). What the survival of the fittest means, we have to understand also what the term "fit" means. Since the environment changes continuously in space and time, short-term definitions do not work. The laissez-faire attitude is useful, for example, in processes of innovation where the flourishing of ideas and concepts is a must and individualism rather central planning would bring success. On the other hand, too much individualism may do harm to communities as Garrett Hardin argues with regard to the problem of the arms race, technology, and humanity: the overuse of common resources by selfish individuals acts contrarily to the long-term interests of the group. Racism and essentialism restrict complexity by excluding individuals or groups from society, which will therefore have fewer elements and less differentiation and thus it will become less complex. Eugenics is biased by a potentially false definition of biological fitness, which changes with time and region. An example is sickle-cell anemia, a hereditary blood disorder, which still ensures fitness, manifested through less severe symptoms, in a region infected with malaria (see Mason). Tim Lewen suggests that social Darwinism once used to justify imperialism and colonialism does not lead to an increase of complexity in society and it should be replaced with the hypothesis of cultural evolution presuming that over time cultural change, such as the emergence of agriculture, occurs as a result of adaptation to changing external conditions such as climate change or population growth: "the most important inheritance mechanism in all species — our own included — is genetic inheritance. Evolutionary psychology regards the human mind as evolving through a conventional process of natural selection acting on genetically inherited variation. For example, an evolutionary psychologist might explain the widespread taste among humans for fatty foods in terms of the importance in our species' distant past of consuming as much fat as possible on those rare occasions when the circumstances presented themselves. Such a hypothesis can also help to explain novel cultural trends: the recent increase in obesity is explained as the result of a novel environmental change — the increased availability of cheap, high-fat foods — acting in concert with a once-adaptive, now dangerous, gustatory preference" (Lewen <http://plato.stanford.edu/entries/evolution-cultural/>).

It is known that point mutations play a crucial role in protein evolution. Here again, conservatism can be observed because the overall sequence and, in most cases, the basic features of the three-dimensional structure remain unchanged. If too many residues are replaced by others, the protein may lose its original function and even its overall structure. Darwin's assertion was that organisms reproduce with only small changes between generations and this might be the reason why certain entities have been conserved for a long time. The cell as the basic unit of living organisms remains conserved, although differentiated, in almost all subsequent forms of life. We know of several dozens of different cell types all of which include a nucleus and are surrounded by a membrane which isolates it to a certain extent from the outside. Vertebrates have preserved their spinal column and mammals have retained their womb for hundreds of millions of years. The hypothalamus, which links the nervous system to the endocrine system via the pituitary gland, is found in all mammalian brains including humans. It is probable that it originates in the insect neuroendocrine system maintaining the status quo in the body and controlling, among others, emotions and sexual activity in mammals (see De Valasco, Erclik, Shy, Sclafani, Lipshitz, McInnes, Hartenstein). While the hypothalamus has remained part of the human brain, its activity has become controlled allowing us to moderate feelings of distress and aggression. In general, the biological evolution of mammals is conservative: the overlap between various regions of the mouse and human TIP39 gene varies between 80% and 96%, while the genetic material of humans overlaps with that of the chimpanzee within 99.4% (see Wildman, Uddin, Liu, Grossman, Goodman 7181). It has to be stressed that this spectacularly close relationship refers only to those genes which encode proteins: in other ones much larger differences can be observed.

The preservation of old constructions during evolution can also be observed in the environment, as well as in its most complex subsystem: human society. A substantive conservatism referring to our planet is outlined in the Gaia Hypothesis of James Ephraim Lovelock and Lynn Margolis who suggest that the biosphere and the physical components of the earth are closely integrated to form a robust and complex system that maintains the optimal physical conditions for life. Gaia is a complex entity involving the earth's biosphere, atmosphere, oceans, and soil, which support an optimal physical and chemical environment for life on this planet. Although parts of the system may, and in fact do, change in time and space, basic conditions for life remain conserved in the long term. One example of conservative evolution in society is the family, an important vehicle for the transmission of knowledge, values, attitudes, and practices essential for the survival of a culture (see, e.g., Diamond). Early families were held together merely by physiological needs, but later the role of family changed and has often been extended. During the feudal era, noble families played a crucial role in the distribution of power and with the advancement of the Industrial Revolution, well-organized family enterprises appeared (see, e.g., Fukuyama). The Roman system of laws was followed in European jurisdictions until the end of the eighteenth century and even longer in some countries such as Germany. For this reason, many modern civil law systems, and especially private law, in Europe and elsewhere are influenced by Roman law. For example, the institution of the lawyer has been conserved, even if in a somewhat different form: in Rome, the lawyer (*patronus*) could offer strategic advice and could give a speech on behalf of his/her client, but he was not allowed to be paid money for his services (see Tellegen-Couperus). These examples show that social mechanisms also evolve and that evolution is conservative. It rarely eliminates an existing mechanism or structure unless it is actively harmful. Evolution occurs by the adaptation of existing mechanisms to new purposes. Thus, the air bladder of a fish becomes the lung of an amphibian and a feudal parliament that evolved to resolve disputes between nobles and king becomes an instrument of democracy. It seems to me that evolution is a process wherein continuous replacement of the old is based on well-established structures (see Teilhard de Chardin 70).

The evolution of the universe did not follow a straight line and a large variety of potential solutions developed and of which only a few were successful, others became blind alleys. An example from the early history of the universe is the formation of black holes: in black holes, gravitation is the dominant force and not even light can escape. Chemical evolution on Earth lead to the formation of complicated crystals, which compose almost the whole of its mantle; however, these are again blind alleys because of the limited variability of their composition and the limited mobility of their components. Organic molecules, with millions of possible compositions and structures, can only encode enough information. This allows for biological evolution: biological evolution is a branching process, which means that species are altered over time and may split into separate branches, combine with each other, or disappear by extinction. This process needs time and is graphically represented by the phylogenetic tree, which visualizes the order in which evolutionary events may have occurred. In case of a splitting event, a mechanism of adaptive evolution and that leads to the development of a variety of related species, is at work. This usually occurs when environmental changes end up in extinction and allow niches for survivors. The evolutionary lines of the phylogenetic tree are bifurcated, leading to the formation of a variety of species which compete for available resources. Success means the transfer of abilities to subsequent generations. An unsuccessful species either goes extinct or remains at a certain degree of development, thus running into a blind alley. If a species has appeared, it can evolve further to a certain extent, but it does not undergo essential changes and remains in its original state (see Eldredge). Julian Huxley argued that human evolution is the only line of the evolutionary progress still continuing, which means that all other lines of the phylogenetic tree ran into blind alleys (see Huxley in Thompson).

The simplest living species are the single-cell organisms, but that already possess the basic attributes of life: they are able to metabolize various substances (i.e., food) from the environment, transform these substances to gain energy and build their organism, and to excrete used material. Another essential ability is reproduction, which allows the species to survive. The autonomy of a cell is secured by a membrane separating it from the environment, but allowing uptake and secretion of various materials. The simplest living cells are prokaryotes, which are without separated functional units while the more developed eukaryotes possess a nucleus with the genetic material (nucleic acids) to ensure reproduction, as well as a cell factory, the mitochondrion necessary for metabolism. From a multitude of single-cell organisms, three routes continued the path to plants, fungi, and animals. A variety of bacterial species deteriorated in their level of sophistication. Their descendants can be found everywhere in the living world, but they do not evolve further. Since plants are immobilized by their roots and do not possess organs, they also could not evolve further. The successful evolutionary route allowed animals to develop nervous systems which are able to collect and process information from the outer world. Nervous systems are necessary for survival. Insects, like ants, proliferated in an enormous variety; however, because of their outer chitin shell, their size is limited and does not allow the development of a sophisticated nervous system. Although ant and thermite communities are wonderfully organized, they cannot cope with environmental threats caused by, for example, extensive fires or floods. Vertebrates, on the other hand, were successful because of the beneficial mechanical construction of their body. Mammals evolved the ability to keep their offspring within their womb for long periods allowing their brains to increase in size before birth. A larger brain, with two hundred billions of cells connected to each other, allowed humans to get on the top of the evolution pyramid and leave apes back in a blind alley with their smaller brain sizes.

Cultural evolution is also full of blind alleys. The successful line leading to the formation of present-day information society, to our knowledge the most complex system within the universe, led through the cultures of the Mediterranean, from Egypt via Hebrew monotheistic religion, from Greek and Roman empires to Christianity, Enlightenment, and democracy. Several cultures ran into blind alleys, like the Maya on the Yucatan peninsula. These peoples had a developed system with admirable engineering potential, which left some wonderful buildings to posterity. However, they could not cope with their shrinking resources and thus the overuse of land and water gradually devastated them. Another blind alley was the empire of Genghis Khan: his well organized military system vanished after the third generation. Blind alleys may become successful again, like the Chinese civilization, which lead the world until the fifteenth century, then went down, but today it is reviving again to become world leading economic power.

There is ample evidence for the observation that the complexity of our world increases at an accelerating pace. After the Big Bang, 13.8 billion years ago, the elementary particles appeared almost promptly, but subsequently nothing much new occurred for a long time. Complexity increased slowly for five billion years until the Milky Way, a relatively complex system of stars of various types, was formed. A further 5 billion years was needed for the development of our solar system with the sun as the central star providing energy and to earth with just the appropriate distance and size to ensure the necessary conditions for chemical evolution. In the mantle of earth, a variety of different atoms originating from the outside world were captured allowing for the formation of complex atomic systems of crystals and molecules. As I mention above, crystals proved to be blind alleys because of their rigidity in not allowing structural changes, but mobile and flexible organic molecules offered an unprecedented variety of means for storing and processing information, a prerequisite for the increase of complexity. Then a quantum leap followed and within some hundreds of millions of years, a special system of life developed. This system offered a unique and successful means for increasing complexity. After this, the evolution of life slowed. It took almost two billion years for the development from simple prokaryotes to more complex eukaryotes. From this time, biological evolution again accelerated with vertebrates arriving 800 million years later. Oxygen appeared in the atmosphere helping animals, originally in oceans, to conquer the continents. Within 250 million years the dinosaurs became sovereigns of the living world. After the clash with an asteroid, the changing environment opened to a new branch on the phylogenetic tree — mammals — which led to humans appearing 100 thousand years ago. With the termination of the Ice Age 13000 years ago, humans could find appropriate living conditions almost all over the world and thus began cultural evolution.

Compared to the former changes triggered by the evolution of the universe, cultural evolution happened at a breathtaking pace. The first cities were built up ten thousand years ago: Egyptian civilization was followed by the Greeks and the Roman Empire with their high levels of organization and engineering abilities. Book printing was invented in Korea 800 years ago and in Europe 450 years ago, thus accelerating the exchange of information. The Industrial Revolution 250 years ago again triggered rapid development when engines took over the physical burden of work. People born in the 1940s witnessed within their life span the explosion of information society starting with the mathematical foundation of the computer and the development of technical communication including cellular phones and the internet. Everyday life has become a series of continuous changes to be digested, former values are questioned, and thus the process of adaptation of the individual becomes more difficult. The feeling of political impotence combined with the acceleration of changes that affects individual biorhythms and lifestyles, as well as the family structure, work environment, education, and culture are aggravated even more by the acceleration in the destruction of the natural environment (see, e.g., Rosa). Crime, violence, and drugs accompany the process, which, in principle, has only one ultimate goal: increasing the physical consumption of the individual and people in general. Accelerating time allows impressions to surpass a threshold and makes obvious that the present order cannot be sustained. Pollution, exhaustion of raw materials, increasing societal differences, and the resulting migration and regional conflicts cry out for a change. An alarming result of cultural and industrial evolution and the population explosion is that humans conquered practically all habitable regions of earth expelling thousands of biological species from their territories. In turn, this will result in mass extinction, which may have deadly consequences to the living conditions of humankind itself (see Kiss esti).

It is easier to recognize the need for a change than to find a solution, nothing to say about realization. One important attempt was made by the Brundtland Commission in 1987: it defined a sustainable development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (15). Sustainability relates to the continuity of economic, environmental, cultural, social, and institutional aspects of human society, as well as the non-human environment. Referring to continuity, we can recognize the concept of conservative evolution. The definition has been refined by Herman Daly, who considers sustainable development as "development without growth beyond environmental limits" (9). This means that three conditions must be fulfilled in order for development to be considered sustainable. First, renewable resources must be used no faster than the rate at which they regenerate. Second, nonrenewable resources must be used no faster than renewable substitutes for them can be put into place. And third, pollution and wastes must be emitted no faster than natural systems can absorb them, recycle them, or render them harmless.

Since the first world summit in Rio de Janeiro in 1993 the term "sustainability" has become a mantra covering a huge space in media and often referring to contradictory concepts and goals. In order to have a clear view of what this term means, first we have to define what we want to sustain and what sustainability looks like. In contrast to the message promoted in media, the term "sustainable development" does not refer to continuous economic growth, which is based on increasing material consumption. This implies a business as usual scenario as it is not difficult to recognize that the continuous growth of material consumption and the transformation of raw materials to wastes at an increasing pace, is impossible. Politicians, bound to short-term administration periods forcing them continuously to lead campaigns for the next election, are necessarily populists in the sense that they never offer short-term consumption restrictions in the hope of potential long-term benefits. Therefore, they cannot admit that continuous economic growth is unsustainable: they dismiss necessarily the concerns of the Club of Rome (see Meadows, Meadows, Randers, Wohlsen Behrens). Continuous growth is also imposed on politics by the demand to reduce social tension caused by the rapidly growing differences between a small group of wealthy people and billions of the poor, who are often deprived of necessary amounts of drinking water, food, and shelter. The income difference between the richest and poorest has been growing or stagnating over the last decades in most countries, while it decreased only in a few (see "Economy Statistics" <http://www.nationmaster.com/graph/eco_gin_ind-economy-gini-index>).

It is also improbable that the present level of consumption per capita can be sustained. The ecological footprint measuring the burden put on the environment by consumption already exceeds the estimated capacity of the earth and it grows continuously from year to year (see "World" <http://www.footprintnetwork.org/en/index.php/GFN/page/world_footprint/>). The reasons for this include the increasing world population, which will peak at about nine billion by the end of this century, and, primarily, the demand for increasing per capita consumption especially by people in the developing world. I do not believe in a quantum leap in technological innovation, even if development accelerates. I believe any innovative technological discovery will address this issue, and even if such an invention appears, decades may still be needed until it can be introduced into everyday life. Instead of insisting on economic growth, we should sustain the increase of complexity. Although the time span of various scenarios is infinitesimal as compared to that of the history of the universe, accelerating time allows us to follow the trends of increasing complexity even in short-term projections. Now we face rapid cultural evolution: in LaPorte's terms, the number of components (persons, smaller or larger groups, cultures) of society, as well as the degree of their integration using the internet and their differentiation through billions of users increases and, in the absence of a global crisis, will increase further. Religious, professional, scientific, cultural, and interpersonal communities may use this opportunity to get in contact with each other and exchange information. A variety of new ideas, propositions, descriptions, rules, and hypotheses is being formulated continuously. Only some of them will survive and will become part of our cultural heritage. This evolutionary process is also conservative in that new ideas have to be based on the historical experience of humankind otherwise they may vanish in the long term. The protection of life, human dignity, private property, and taking care of the disabled and poor have always been key elements in most cultures, even if with varying emphasis.

Sustaining the increase of cultural complexity allows for the transformation of unnecessary material consumption to non-material forms, like computer software, cultural events, arts and literature, games, or simply chats. Marketable products related to these non-material goods leaving a minor ecological footprint behind them and can help the economy to grow without hurting the environment. The economic framework of a society in transformation from material to non-material consumption could be modeled on the ecosocial market economy (see Ecosocial Forum Europe <http://www.oekosozial.at/uploads/tx_osfopage/Policypaper_Ecosocialforum_web_01.pdf>). In the spirit of conservative evolution, this construct is based on the traditional market, which has been for thousands of years the best system for the optimization of the production and distribution of goods and services. The free market works optimally if the number of vendors is very large and their size, information level and capitalization are about the same. Competition under such conditions generates optimal solutions and innovations, which serves the benefit of the customer and simultaneously creates profit for the producer.

Two basic market restrictions are, however, a must to avoid unnecessary and unreasonable competition harmful to society, as well as the environment and may lead in the long term to conflicts both regionally and globally. The first restriction protects those members of society who cannot compete because they are either too old, ill, or disabled. While such individuals represent a significant group both in the developed and developing world, they cannot be left alone because it creates by exclusion resulting in misaligned social structures in turn resulting in conflict. Some kind of positive discrimination should be introduced for the benefit of these citizens. The second, and increasingly important, restriction concerns the use of the environment. Exploiting resources reasonably, while also allowing future generations to use them and reducing the emission of wastes cannot be regulated by the market alone, but should work within a framework of environmental constraints. The simplest way to include environmental issues in the market would be to include them in prices. For example, the price of industrial water could contain — besides the cost of harvesting, cleaning and transport — the price of its recovery in natural deposits. Such eco-prices suppose, however, long-range considerations, which are not typical in present-day economic policies or politics.

In conclusion, I must stress that the present level of material consumption cannot be maintained and that, instead of insisting on continuous economic growth, a new paradigm should be found. A possibility is to recognize basic trends of evolution and turn from consumption beyond our actual physical needs to sustaining the increase of complexity of our culture. A need for such thinking already appears in the field of ecocriticism (see, e.g., Gaard, Estok, Oppermann; Heise), a movement analyzing and promoting works of art including literature and raises questions of ethics about human interactions with nature while also motivating people to live within a limit that will be binding over generations.

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