Dreamtime Economics 101

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Dreamtime Economics or The Capacity for an Integral Vision

Why **Dreamtime?**

Dreamtime is the English translation of the Central Australian Aboriginal word "Tjukurrpa." Tjukurrpa refers to the worldview they hold (Mutitjulu Community 1985; Palmer 1991). In the dreamtime, time has no direction. The past, the present, and the future happen at the same time, the dreamTIME. Common for archaic peoples, in the dreamtime everything on earth has a practical as well as a spiritual dimension. Orientation within the dreamtime, both practical and spiritual, is found in dreams. Science and technology are therefore inseparably connected with religion and philosophy. It thus constructively integrates technical, academic, practical, and spiritual knowledge. Thus the dreamtime symbolizes wisdom, a forward reflection based on past learning experiences. This precludes a deep understanding of the essence of human life upon earth, an ideal state, which goes far beyond the accumulation of intersubjectively approved knowledge. A real dreamstate to which we cannot return fast enough.

As the quest for sustainability proceeds along the emerging, ecologically based coevolutionary paradigm (Capra 1996; Clark and Munn 1986; Haug 1983; Norgaard 1994; Odum 1971), it becomes increasingly obvious that it is not sufficient to try to scientifically determine "safe" limits for human activities within the bio-physical environment. The bio-physical environment is not a given finite creation that we can explore conclusively, but it is always only a temporary outcome of an ongoing process with an open future. Furthermore, environment and society are not two principally separable parts of a world machine, but rather two mutually related and, therefore, inseparable components of a forever unfinished co-evolving whole. In other words, there is a continuous interaction between the two, meaning that changes in one may cause, or may he caused by, changes in the other. Within such an evolutionary systemic concept of inter-relatedness and self-organization, whether we do one thing or another makes a difference (Boulding 1981). This unavoidably entails the need for orientation on the human side (Oliver 1992; Stokes 1992; Ulrich 1993; Schutz 1996), as well as upon the identification or assignment of systemic purposes of the total system "human life" (Churchman 1979; Schiitz 1997a).

If society turns to science for advice concerning the environmental crisis, science may describe the status of the biosphere, and may refer to the risks connected with the status quo, or even refer to incompatible tendencies of specific subsystems with respect to the total system. But science, given the contingent and open future of any evolutionary system, cannot answer the key question, whether we should support the status quo of a system, and if so, at what costs? Thus a systemic view of the biosphere, the society, and the economy is constantly confronted with the need to decide whether or not a given state of the system is favorable to its purpose or not. If so, the stabilizing elements and relations of the system should he strengthened. If not, the reorganizing forces have to he encouraged. Science alone, let alone natural science, cannot deliver the degree of guidance needed. Therefore we should search for, discuss and agree upon orientational concepts for humankind at a number of various levels.

Max Weber (1904) was certainly correct claiming that science might never objectively prove the superiority of any moral value. But it is also correct that the meaning or purpose of any system has to demand a minimum compatibility with its overriding purpose from its elements, relations, and subsystems if it wants to avoid disintegration. All individuals of a society are therefore free to develop their own meaning, but for the continuance of society, this freedom cannot be arbitrary. Thus, being challenged by the ecological crisis to reorganize society, the possibility to discuss the theoretical and practicable consequences of alternative system meanings has become a key aspect for future social development. Next to an institutional form for this "discourse" we need a theoretical framework within which possible implications of alternative ends for the individual, the society, and the biosphere might be analyzed. In the case of economics, contingent on the status quo it should strive to unfold the various morphological and structural options it conceives, and their connection with various sets of values. Only then is society capable of discussing and deciding upon the various options of its very important subsystem. Our current praxis, to leave nearly all important decisions to the market cannot he satisfying in the long run.

But how might such a principal change come about if studies reveal that mainstream neoclassical theory is not value-free after all? Neoclassical theory implicitly uses some very specific assumptions to explain any human behavior in the econom-

ic realm as a voluntary revelation of self-interest. Combined with a naive glorification of individual rights, many western societies experience, thus, a paralyzing impotence concerning the customary economic warfare among individuals and against the biosphere. Even though many conventional economists may concede these worrying trends (Young 1992), they must feel helpless (Schiitz 1990). If they admit that economic actions do not necessarily reflect the true preferences of the individuals, it seems impossible to uphold the idea of an optimum state for society based upon such involuntary actions. Furthermore, even if they would admit it, how else should we guide the development of our economies (Anderson et al. 1988)?

We propose to break this unhealthy reasoning by submitting economic reasoning within a coevolutionary systems framework first to culturally oriented decision processes determining in which direction society should evolve; second to ecology; and finally to the market (Schütz 1997b). The fine but decisive difference to existing ideas of culturally bounded markets is that, in our concept, the market is simply a very useful instrument to transmit signals and impulses. But the market is never an instrument to solely evaluate those signals and impulses. Nor is the market seen as an automatic mechanism that will—if left alone—guide society towards an all circumventing bliss point. On the contrary, in every aspect of the economic world—goods, prices, distribution, institutions, technology, life-style, etc.—ecology and culture are present. Thus, in any economic analysis ecology and culture must be identifiable, and at least in some cases, must be the relevant variables in any economic argumentation. Compared with current economic reasoning such a concept turns economics upside down. But we see no alternative. We have to re-discover that even though many times we feel constrained to surrender to the self-will of existing structures, it is meaning that maintains or changes structure. Finally, and maybe most important, we need the wisdom to agree upon appropriate meanings. We therefore call our concept Dreamtime Economics.

A Quest for Guidance

This fundamental need for a common basic orientation however, seems to contrast sharply with the present lack of a common ground within society. But precisely speaking, it is not really a lack of common ground at all. It is not the multitude of competing values on the level of the individuals that is giving us trouble, but the nature of our currently held common ground. The problem is not that we all believe in personal freedom for the sake of individual self-realization, but how we interpret the intended self-realization: go for the maximum possible. It has become common to disregard any self-imposed limitations to human action (Daly and Cobb 1989). Concerning society, this attitude tends to disintegrate communities, and regarding the biosphere, tends to push us, despite continuous technical progress, far beyond the space within which a sustainable existence seems feasible.

Economic reasoning based solely on individual preference maximization has fostered the current, much lamented, change to come about. In conventional reasoning, culture may determine the goals and the framework, economic theory analyzes and evaluates objectively ("value-free") possible means and ways. By cost minimization it arrives at the best, hence most efficient, way to any culturally determined goal. A very natural division of labor within academia is for ethics to determine the goals like sustainability, and for economics to determine the means like property rights. If we determine economic efficiency through a value-free economic theory, then the societal decision process defining social efficiency has completely lost touch with anything other than the economic value-set within society. God is dead, long live the market. In doing so, economic reasoning is the final authority that decides what is right or wrong, the traditional task of culture. Economic reasoning has thus established itself as the cultural value of our time (Robinson 1962). As such it cannot continue to uphold the premise of being an objective means to otherwise culturally defined ends. It has become an end in itself. If this is true, and if conventional economic reasoning has, as we have ample reason to believe, inherent shortcomings or even flaws, society will find itself trapped.

Following ecology and systems theory we claim that a successful development of any system is due to the balance of individual freedoms against systems priorities, like differentiation and integration, or partial and total analysis. If a system cannot adapt itself to changing circumstances and initial conditions, it will not be able to survive in the long run. If a greater differentiation of parts cannot be re-integrated, according to a common purpose or meaning, the system as such will disintegrate (Schwarz 1996). It thus takes both complementary aspects, growing differentiation and a shift of integration on a hierarchically higher, or even abstract level, to be successful. Furthermore, according to an ecological worldview, in the long run an individual might never be better off than the total system. This in turn demands first coordination of individual efforts so that they have at least implicit "meaning," and second, provision for an adequate living for all. Both the sigmoid shape of the efficiency curve as well as practical experience show that an increase in the efficiency of the total system may very well be due to marginal increases in efficiency that cannot provide an adequate basis for an individual existence. In other words, any economic system may reach an ecologically high level of efficiency if. and only if, it is willing to redistribute resources in favor of those whose efforts provide for an increase in the systems efficiency but not for an individual existence. Of course, one can argue about where and when to stop this redistributive process. But without redistribution, a human society will not reach the efficiency level possible.

The Biophysical and Cultural Embeddedness of Economic Systems

As long as the human being is part of the biosphere, any economic system must observe the principles of the biosphere (Daly 1991; Costanza 1991). However, the theoretical reflection of the transformation of natural materials through human beings depends upon how individuals and society understand and explain the world (Norgaard 1994). It is therefore safe to claim that any economic system is embedded both in the biosphere of the earth and in the culture of its society. The basis for the following framework is thus the conception of the real economy as a self-organizational, systemic element of culture within the biosphere (Brinkman 1981; Polanyi 1944; Stokes 1992; Schütz 1990).

The Role of Cultural Values in the Economy

At least since Max Weber's studies on Protestant ethics and capitalism (Weber 1922) we have been aware of the fact that the general attitude towards the role of human beings on earth definitely influences the behavior and development of any appurtenant economy. If we understand culture as the historically unique man-made product of the environment, the existing body of knowledge and ethics, then the economy is one segment of culture. The potential for creative self-organization of the economy reveals itself in the production processes, the evaluation and distribution mechanisms, as well as in the set up of its institutions. Together with the organizational form of the economy the various aspects of culture determine jointly how and to what extent goods and services are produced, as well as how those goods and services are evaluated. Even the range of a real economy depends upon ethical values, since both the choice of an applicable technology and the degree of cooperation within society and within the economy determines the amount of synergistic gains feasible with an adopted economic organizational form.

Several key elements of the economy necessarily require first normative decisions. For example, one central concept is scarcity. Since there will always be several shortages at the same time, society has to decide which shortages it will accept to avoid others. Further, social systems differ according to which resources are free for "unlimited" individual consumption and which are not, and how the distribution is to be achieved. Both the definition of and the method to deal with scarcity become a cultural, value-loaded phenomena. Therefore, different economies deal with different sets of scarcities via different institutions. The ethical background of scarcities pops up when consumers in the **USA** seem to differentiate between the legitimacy of the market-price-mechanism for basic necessities and other goods, as they apparently do (Kahneman et al. 1986). This leads to the question, to what extent options and resources should be valued by and distributed through markets. It must be kept in mind that real prices reflect both biophysical needs as well as culturally determined preferences and institutions. **An** explanation of prices based solely on given individual preferences, as mainstream economics still does, might he blind to the fulfillment of basic human needs and to cultural aspects of production and consumption beyond economics.

The refusal to see the market-price-determination within an ethical background has severe consequences. The market mechanism reduces everything—human beings, the environment or technological risks—to a comparable singular pecuniary number. Paying a "price" is conceived as a kind of absolution for any consequences that are connected with a certain good or aright to do certain things. It is obvious, even without questioning the specific procedures, that this must contrast with the quest for a kind of holistic decision making, especially in context with the human being or the environment.

The necessity of ethical decisions is also underlined by the lack of certainty within an evolutionary system framework. In the sense of Frank Knight's "We just do not know" (Knight 1921), economics has to go beyond probability and accept true uncertainty. This in turn implies that undesired ex post states are not always due to insufficient ex ante reasoning. If we agree on the necessity of ex post interferences with the results of the market in order to take on holistic (social) responsibility for individual consequences of unpredictable events, or if we react ex ante to new and therefore unproved potential dangers, then these actions will interfere with the existing distribution and necessarily depend on normative decisions. The soft spot is not the right to intervene but how to reach a broad legitimization for an intervention amongst rivaling ethical values. This is a question we will return to later.

The Environment and the Economy

A second principal aspect of the idea of cultural and biophysical embeddedness concerns the restrictions an economy might he facing. If we consider the principles of the biosphere and cultural values as restrictions for any economic system and economic reasoning, an economy may do whatever it feels like if it manages to stay within those culturally determined social and environmental limits. If not, the economic system and economics with it may risk losing its moral legitimacy. Maybe more important, by consciously crossing the culturally determined environmental limits or unconsciously, in case those culturally determined limits are not "objectively sufficient," the economy may risk the elimination of the ecosystem it belongs to, or in the worst case the elimination of humankind.

At least since the apocalyptic visions of the Club of Rome in the late 60's, environmental and resource economics have been eagerly engaged to secure the observation of the currently perceived limits of the biosphere (Young 1992). They even tried to tackle the problem of intergenerationalequity. This was mainly done not by somehow changing the economic rational of market price cost minimization. On the contrary, the proponents of one current mainstream position call for an unrestricted and even extended realm of the market price mechanism

(Arrow 1985). According to this position, prices on environmental "goods" and "bads" will keep us far away from ecological disaster. Would you really advise the biosphere and your society to trust this theoretical claim, in spite of the fundamental problems current market based economic systems are facing? These problems include an unrestricted immanent growth dynamic, exclusion of large parts of the population from material wealth, the concentration of economic power in the hands of few, and the refusal to deal with the question of just distribution both within a society as well as between nations.

Ecological Lessons

Diversity Buys Efficiency

Conventional wisdom in economics holds that there is an inescapable trade-off between social considerations and efficiency measured by minimal costs. Regarding biological evolution it has been argued for ages that to be efficient means to be successful. Yes, there are different species competing for the same niche or resources. Yes, it is most likely, that the more efficient ones will succeed. But it is a competition at a lower, less important level. Efficiency in ecology is never reached through partial analysis alone, but by adopting a systems perspective. Even if a single species might have successfully outrivaled a competitor, in the end the winner still depends on the success of the ecosystem it is a part of. The species simply can not live on its own. Normally this competition will never result in a complete eradication of a specific form of life. The "loser" continues to live in and to contribute to the ecosystem, just in smaller numbers than before. It is not a viable option, in ecology, to exclude members of an ecosystem from the reproduction of their life basis, since all keep the current system alive and all improve its potential future. In an open coevolving future the system might very well find itself in a position where it might be forced to rely on the specific capabilities a less efficient species held. Extinction of a species is the highest price possible a system has to pay for an internal competitive selection process. It constitutes an irretrievable loss, and it denies the system of options for its future development. Thus the winner can never have it all.

Ecology teaches us further that this "social" behavior, contrary to conventional wisdom, increases efficiency. Efficiency of natural ecosystems is—with rare exceptions—not achieved by reduction of diversity, but rather through increased diversity. It is empirically well documented that for nearly all ecosystems a qualitatively identical observation holds: the efficiency of an ecosystem, measured as the relation between biomass and energy-input (BE), rises with increasing diversity of the ecosystem. The level of ecosystem-efficiency rises exponentially to adjust to a specific satiation limit (Odum 1971; Odum 1983).

The explanation of this observation is easy and intuitive. If an ecosystem establishes itself around specific leading plants and animals, survival of the ecosystem is more secured, the more resources and energy are used up as completely as possible. This is always the case, if the material flows within the system are closed as far as possible, and the continuously reoccurring sunlight is completely absorbed. Since each species of the ecosystem uses only a specific range of inputs, and transforms them to another specific range of outputs, it is evident, that the efficiency of a system always rises, if one species may use the output of another species as its input. As long as the incoming sunlight is not completely used up by the populations of existing species, any new species increases the energy retained in the system while at the same time reduces the stress due to waste. It is also obvious that the number of potential close cooperations between species within a system increases exponentially with the number of species rising. Together with strong netting this will result in cumulative dynamic patterns in the behavior of the system. Dependent upon evaluation, impulses may either be buffered throughout the system or may serve as starting points for exponentially expanding processes within and of the system itself. An exponential growth process will end when the total populations of an ecosystem use all available energy to reproduce the status quo. This also explains the empirically observed logistic type of relation between efficiency and diversity.

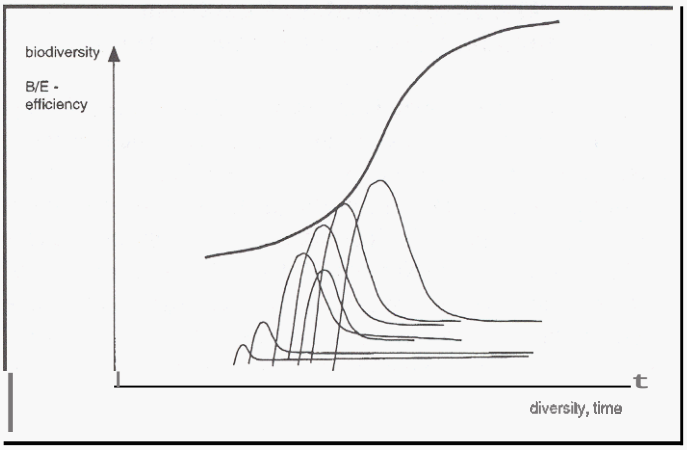

Figure 1. Populations, diversity, and efficiency.

Human Appropriation of Net Primary Production

If we also consider that diversity itself depends on energy potentially available (Vitousek et al. 1986; Wright 1990; Brown 1991) we may identify a simple feedback loop consisting of Net Primary Production (NPP), diversity, ecological efficiency at the systems level, and anthropocentric use.

The more NPP might be spared from anthropocentric consumption the greater the potential diversity, and the higher the potential level of efficiency available. We are more familiar with the other way: we increase the "efficiency" of cultivating plant or species by eliminating its nutritional competitor. Thus by lowering the biodiversity within an existing ecosystem to cultivate a specific species we started a negative feedback process. The lower the diversity, the lower the efficiency of the

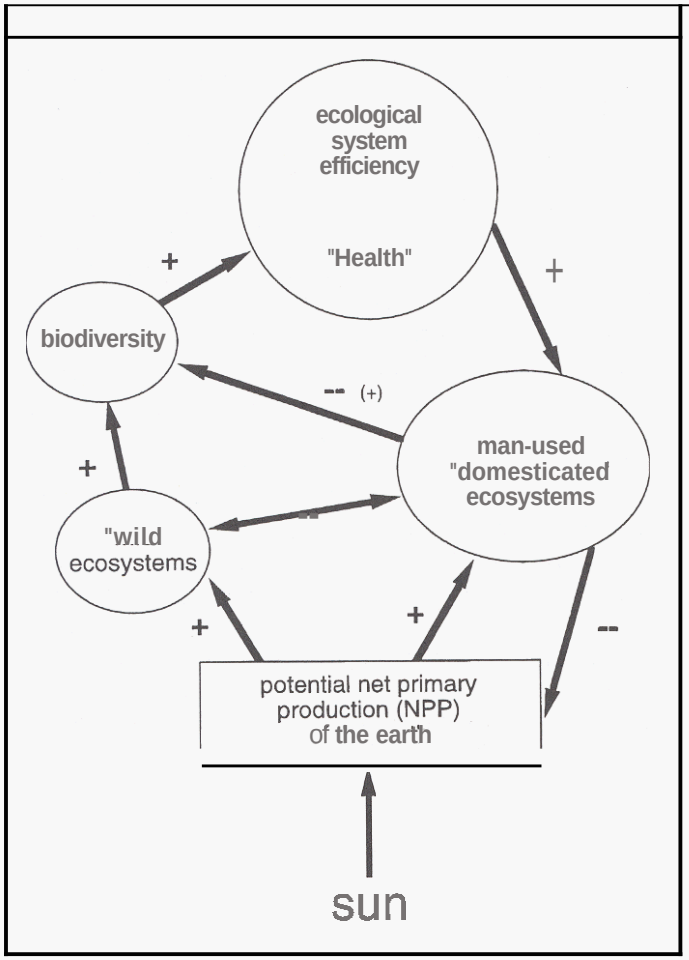

Figure 2. Net primary production feedback circle.

system, the lower its vitality and its potential to respond upon disturbances. We counter such irreversible reductions of NPP potential through enlargements of domesticated ecosystems, increased energy input in form of labor, machines and pesticides, and most recently by genetic manipulations. But whatever we do, in spite of certain positive short term yield effects, we are likely to start a new round of genuine diversity reduction. All these negative long-term effects happen in spite of the fact that the potential for anthropocentric uses of an ecosystem would currently rise in the long run by reducing our demand for NPP in the short run, either directly by using previously disregarded resources the ecosystem produces, or indirectly by raising the potential efficiency level for domesticated ecosystems.

The relationships between biomass, NPP, and biodiversity may be expressed by the following graphs. The less we are able to use any ecosystem in its established relationship of species, the more we move towards the origin. As long as we stay in the green area, a mild reduction of diversity may even considered to be positive: while we raise NPP we also postpone sclerosis, and thus add to the long-term stability of the ecosystem. This holds as long as we do not touch upon the poles of the ecosystem.

Rising human populations and the strive for a rising living standard (with respect to energy) put so much pressure on society to provide adequate resources that we have moved out of the green and into the yellow zone. Now diversity is reduced and the BE-ratio will decline somewhat. While the marginal NPP increase is slowing down, it is still positive. But marginal costs will certainly be higher, so technological progress will be seen as the only way out. By this acceleration of the negative tendencies for the biosphere, most recently we tend to have gone past the stabilizing properties of the ecosystem in use and have in some circumstances definitely entered the red zone. The increase in efficiency of harvest technologies and the tendency to market "new" species will certainly postpone the realization that we have entered the red zone. With respect to fishery this will only be acknowledged if the accelerating decrease in NPP can no longer be met by increased technology and energy. Why do I call it the red zone? The dynamic tendencies of the system have drastically changed compared to the yellow and green zone. The diversity and the net of interrelationships have been damaged to such an extent that the regenerative capacities of the ecosystem seem to be unable to sufficiently counter the dynamic tendencies set off in previous periods. NPP, diversity, and the B E ratio tend to decline sharply. What does this call for? Leave red, stay in yellow, and move towards green. Considering the fact that current economic logic (cost-minimization) does not support such reasoning, **the** reader might sense what tremendous tasks are lying ahead of us all.

In summing up we can say that ecology teaches us that the more positive externalities are "produced" by the elements of a

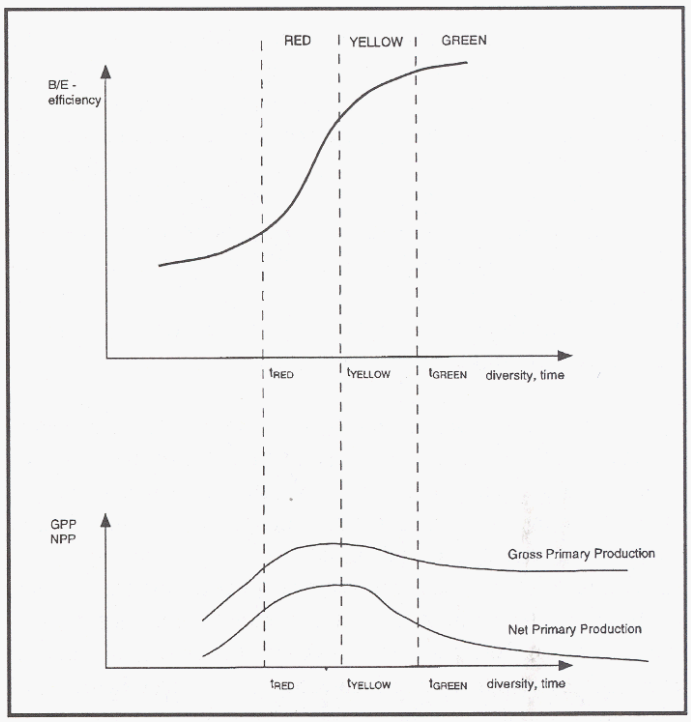

Figure 3. Biodiversity, systems efficiency, and primary production.

system, and the more energy reserves (NPP) left for potential differentiation, the greater the chances that the system may reach a maximum level of systems efficiency, securing the survival of all species of an ecosystem in the presence of competing interests. Or in economic words, the secret of ecological system efficiency is its capability to establish a system of nested, viable diversity. This system is maintained and expanded by inducing individual system elements to activities connected with positive externalities, including the readiness of the members for close cooperation or even symbiosis.

What Impedes Economics from Living Up to an Ecological Paradigm?

Certainly, economics cannot solely be blamed for all negative trends, but as we pointed out earlier, economic reasoning is the key factor for our behavior in our current culture. If we ask ourselves why mainstream economic theory finds it so hard to accept and follow the current transformation of reasoning towards a more holistic, ecological paradigm, we encounter various answers. The two most important ones are discussed below.

The Mechanical Worldview

Maybe the most basic obstacle is that mainstream economics still follows the mechanical paradigm. No doubt about it, a mechanical worldview, based on stability and the possibility to add, withdraw or change parts without changing the characteristics of the remaining parts, remains for some purposes an excellent basis for far-reaching epistemological insights within the natural sciences.

However, if evolutionary, systems-related issues are to be analyzed, partial analysis, appropriate within the mechanistic worldview, might for several reasons lead to erroneous conclusions. First, systems are characterized by the fact that specific singular effects may not simply be added to an otherwise unchanged "rest" but that all elements and relations within the system are influenced by various responsive relationships. The whole system, any specifically identified subsystem, all elements, and their relationships among each other coevolve in mutual dependence. All observable appearances are, to a certain degree, contingent upon each other.

A mechanistic worldview favors stability, or the absence of change. Thus there is no way to model any evolutionary aspect of a mechanistic economic system. This would require at least a concept of homeostatic change, which may finally explain the emergence and dissolution of specific economic structures. Surely, it does not seem rahonal to respond to each external or internal impulse with a complete reorganization of the status quo. Energetically speaking, it makes total sense if each (sub)system tries to resist a continuous reorganization and tries to maintain certain "stable" patterns of appearance. Systems as a whole therefore develop a certain empirically observable inertia (hysteresis).

While stability makes sense, the overriding system quality is the capacity to react and to evolve in as many ways as possible. This includes the capacity of a system, given certain circumstances, to endogenously overcome otherwise meaningful inertia. Especially for open systems, like the biosphere or any economic system, the capacity to react with structural changes to external or internal impulses is vital. Therefore if anything is to be conserved, it is the potential of the system to react, rather than a temporarily adopted structure. Any system might have to change its morphological appearance by varying its elements and their relations, continuously fulfilling its specific purpose.

Consequently, the central key notion of economic theory so far equilibrium — loses its dominate position. It might be easy to define an existing state as a temporary equilibrium of contrary forces, but the familiar interpretations of an equilibrium do not make much sense in an evolutionary framework If we allow for change, within the mechanistic framework an equilibrium could be interpreted as a proportional expansion of all state-variables. But this resembles a blowing up of existing relationships more than structural change. If we look at flow-variables, an equilibrium of flows is both consistent with structural stability and structural change. The concept of equilibrium concerning flow-variables may serve as an indicator for certain dynamics, but it is hard to maintain a priori superiority of an equilibrium as in the mechanistic paradigm.

Partial Analysis Cost Minimization

As we have seen, from an ecological point of view, it might be wise to sometimes restrict oneself so that the system as a whole might strive. Currently it seems that such an anthropocentric self-limitation, in favor of increased biodiversity, seems to be a more appropriate strategy than the opposite recommendation that conventional economic wisdom holds: more is always better than less. Both ecology and economics strive for the best performance possible. Both usually refer to their striving as efficiency. But, whereas ecology builds on diversity, economics builds on homogeneity. It seems to be the cost minimization strategy based on partial analysis that hinders economic reasoning from seeing that point.

The Effects Upon Social Structures

Economists are quick to point out that cost minimization and the international division of labor is both efficient and ecologically beneficial since it tends to reduce net material flows. A reduction of anthropocentrically induced material flows in the environment is unquestionably positive. But that's not the whole story.

In economics, efficiency is usually achieved through monetary evaluation of machines, processes, and persons. Within a dynamic market economy the normally employed partial analysis eventually leads to numerous replacements of all such machines, processes, and people that are considered to be not efficient enough compared with cheaper, hence more efficient

ones. This socially legitimized strategy to become more efficient by cost minimization leads (through diffusion of the cheapest production processes and its inherent bias for mass production) to a homogenization and reduction of diversity both in the biosphere and within human artifacts. Any economic system is the more efficient the more it uses identical machines, processes and persons. Provocatively, it could be said that efficiency is achieved by the extinction of the inefficient.

While ecology also employs the strategy of continued differentiation to become more efficient, differentiation only is never a viable strategy for the elements and the system to follow. From an economic point of view, when a person, machine or process has become inefficient, the elements and relationships of a system are suddenly only a burden for the remaining efficient parts. The best thing would be to get rid of them. Whether one likes it or not, there is a certain economic logic to this, if most economies no longer secure a sufficient basis for existence of all members of its society. Completely contrary to the reasoning of evolutionary systems, it seems to be irrelevant whether the replaced individuals and machines still can make a positive contribution towards the common good, or even more important, what capacities for future development of the system those elements hold. Regarding the references made concerning ecological efficiency, there is ample reason to doubt the long-term rationale of those actions.

Successful development of a system is always characterized by two complementary aspects: growing differentiation and a shift of integration on a hierarchically higher, or even abstract level. But economics has no concept of reintegrating any differentiation processes taking place within the system towards a common purpose. This lack of systemic perspective leads to a continuous crumbling of the system as a whole. For example, the currently praised productivity strategy, which means to produce more with fewer people, does not have an integral system perspective. Without such a perspective we should not be surprised that employment will become the major social problem in the future.

An Ecological State of Mind

A prerequisite for the establishment of such a dreamtime economy is a change in consciousness in the way decisions are made in households, firms and administrative offices. They would no longer be just reactions to force or persuasion, but the outcome of environmentally responsible action directed by genuine insight and emotional involvement. In contrast, the present prevailing economic viewpoint claims that the problems can be solved by submitting hitherto unpriced environmental goods and damages to the price mechanism, i.e., by an internalization of external effects. To implement the necessary measures, however, the economy must now rely on the lever of the political system and the goodwill of the individual. This demonstrates that it is not at all utopian to envisage a cultural change that would cause a fundamental alteration of the economic system such that it no longer functions on the basis of an inherent growth principle. I admit, it is much more demanding. But what else is left?

In other words, given the ecological crisis, our society, including the economic subsystem, will fall apart unless the individuals and the institutions can agree upon a common denominator for integration. How? Top-down? We have had enough of that. And bottom-up? According to Arrow (1950) just counting votes is either consistent or democratic, but never both. Discursive á la Habermas (1981)? But what would be the basis for such a discourse? On the basis of the prevailing mechanistic worldview it is theoretically possible to devise a social system of completely independent individuals, who condescend themselves to contractual relations only in win-win situations. Can you tell me how I should argue within a mechanical worldview to induce a marginally very efficient individual to support a marginally less efficient individual, who cannot live on his effort, but who undoubtedly increases the efficiency of the total system?

As noted previously, the functional necessity of an integrative variable for the total system clearly illustrates that an ecologically sustainable economy precludes substantial changes in both our current scientific paradigm and in our *current* cultural valuematrix. Such changes in turn presuppose a discussion about the self understanding of human being within a relational worldview. Next to scientific insights, such a discussion will be heavily influenced by philosophical or religious standpoints.

There are two reasons why this is so important for any future development of an economy. There will be hardly any prospect to agree upon a common integration-variable within the social discourse, unless the individual members of society have started to change their state of mind. First, we have to abandon the conception of humans being the crown of creation. This means that we can no longer lay unrestricted claim to all available resources. The world around **us** has principally the same right to exist that we do. And what is more, it is we that depend on them. Second, we should no longer put off redistributive measures as social envy, but acknowledge **them** as important instruments to shape society from a holistic point of view. Both points call for a conscious self restriction of every one of **us.** They call for a definition of "enough." We can hold unsaturated wishes, but every one of us should investigate if the consumption of a specific commodity really helps to increase one's contentment. This seems to be the only way to get close to an individually and socially accepted definition of "enough."

A Glimpse into a Dreamtime Economy

What has been laid out so far sums up to an alternative strategy to "business as usual." At the risk of being charged

with a naturalistic fallacy I propose the following eight points:

1. Preservation of at least 30% wilderness.
2. Information about the necessity of a systems perspective.
3. A discussion about the meaning of life within the biosphere.
4. A society-wide learning program to increase the use of biodiversity.
5. Minimize unconscious interventions into ecosystems. Complete use of whatever has been taken out. Any waste has to be returned to natural cycles.
6. Practice sharing. We can minimize interventions into ecosystems not only by reducing our demands, but also by transferring our surpluses to somebody who otherwise would have to intervene into the biosphere.
7. Integration instead of segregation. This means to institutionalize cooperation and sharing. Society has to foster and protect social structure aimed at common usage.
8. Start organizing a "Culture of Positive Externalities." Obviously no human society has the time to wait for the coevolutionary netting of mutual bonds to develop, but we might tap the potential of cooperation and synergetics most easily by designing our actions in such a way that others also benefit at no or little extra cost.

To repeat the key message again: the secret of ecological system efficiency rests in the capacity of the system to induce its members to actions connected with Positive Externalities. The reasons might be found first within the support of diversity while maintaining a sufficient level of integration and, second, the willingness for close cooperation or even symbioses as part of the system's components. A cooperative attitude based upon an ecological worldview is no decorative frill, but a sheer necessity for a sustainable economy.

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