



Article

The Gordian Knot of Sustainability

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Received: / Accepted: / Published:

Abstract: Any comprehensive knowledge system of a certain complexity grounds in specific assumptions that give an answer to the fundamental questions of human being. These assumptions that usually stand at the beginning of any organized reasoning, have long reaching and mighty effects since they form the underlying matrix of any doing that follows. Often these conceptual prerequisites are forgotten thus turning into hidden but nevertheless powerful mental forces that then rule and organize human behavior and reasoning from the unconscious. It is this unconscious level of human behavior that poses a specific challenge to the societal transition process towards a sustainable life-style. Three interrelated sets of mental assumptions that play a decisive role for the human mindset can be identified in this respect. These hidden factors of human action can be referred to as the ontological cause, the epistemological cause, and the operational cause of human behavior and decision making. Any culture provides its members with an ontological worldview thus directing the mindset of its people into a specific direction. The ontological conception of the western scientific mind strongly influences the way modern people try to overcome the challenge of their unsustainable life-style. Similarly modern knowledge is grounded in a specific epistemology that, mostly unknowingly guides the industrial mind. The epistemological bedrock of knowing has a lasting effect on human perception and communication; it controls the way modern people deal with their problems. The operational cause eventually turns modern life into a rat race. It subjects the societal metabolism to a linear concept of logic that profoundly runs afoul the cyclic structure of nature. Ontological, epistemological and operational attractors form a cohesive, cognitive base-matrix whose reorganization has to be perceived as the Gordian Knot of sustainability.

The paper is identical with the prolog of the current book project of the author with the working title: The Change Science. Turning the human mindset towards a sustainable life-

style (Frank, in preparation). It investigates the logical and practical consequences that have to be drawn from the previous scientific work of G. Frank (2011, in print) regarding the self-imposed threat of an unsustainable life-style.

Keywords: ecological fall, epistemological causes, ontological causes, operational causes

1. Introduction

The modern age has been coined by two societal phenomena unprecedented in humankind. Due to its technological and economical innovations humanity has developed into a globally interacting species. There is no secluded niche existing anymore which remains untouched from this global interaction matrix. This is one phenomenon. And there is the second one: A specific worldview became the dominating paradigm of this worldwide community; the western scientific mind. Due to its inherent oppressive absolutism (Feyerabend, 1981) it has eradicated or at least suppressed any potential adversary mindset thus surviving as the sole intellectual attractor.

These two coinciding phenomena led to a situation of extreme vulnerability since there is no mental antithesis available whose penetrating power is strong enough to be perceived and globally accepted in order to correct the fundamental mistakes of the predominating paradigm. It cannot be denied anymore that there are mistakes inherent in this western mindset. Too many unexpected threats occur which should not have happened if the western mindset was in a way correct it itself does not cease stating to be. There is a mix of dreadful developments and global events, natural and social ones, which are often perceived independently from each other although they result from one and the same generative matrix. Environmental pollution, global warming, the continuous loss and degradation of valuable world ecosystems (rain forests, reef habitats, glaciers etc.), the accelerating loss of species, both plant and animal species, the financial crises, the alarming increase of metabolic diseases, circulatory disorders and various types of cancer, and many other disquieting phenomena seem to endanger the future of humanity. In the end, these phenomena are all manmade occurrences and due to their anthropogenic cause we ourselves have to take over responsibility by at least questioning the underlying mental disposition.

Something must be wrong; something that rests deep in the unconscious of this western mindset. I don't want to be mistaken. We are no unconscious robots constructed and programmed by an unmerciful creator. On the contrary, we are sentient human beings driven by our own mental constructions and ideas. We decide upon our behavior and doing by referring everything from an underlying source of knowledge and believe. Whatever we do, we do because we have learnt to do it and the result of this learning process resides in the neuronal archives of our minds. Whether our doing results from conscious decisions or from unconscious processes plays no role in this respect. Both the human unconscious and the human conscious are elements of our selves. Insofar everything is in our hands; there is nothing which is out of our reach.

So there is hope indeed that we can overcome the current dreadful situation. It is on us to successfully change our behavior by continuing learning und further evolving ourselves and the global community we share. Thus we enable ourselves to develop a sustainable life-style and future. It is in our hands to guide ourselves into the right direction. I speak of us both as individuals and as social actors thus transforming ourselves and our corporate and institutional entities that constitute the societal framework of our being.

Especially the scientific mind cannot help interpreting the current individual, ecological and social crises in a specific, critical way. Scientific knowledge roots in a conscious, dualistic strategy of connecting empirical data from experiments and carefully planned observations with logical reasoning and explanations. In this endeavor empirical data serve as prove of concept that represents the human reasoning underlying the scientific methodology. If empirical data do not deliver what we expect; if empirical data contradict our concept developed by our reasoning any critical scientist takes this contradiction as a clear warning: our mental assumptions appear to be wrong. We have to change our reasoning enabling us to further develop the underlying concept and to bring it into a better correspondence with the deviating empirical data.

Facing the current individual, social and natural crises, any scientific mind that takes itself seriously necessarily has to come to the following conclusion. These occurrences simply falsify the dominating western paradigm. They have to be perceived as empirical means that question the underlying, mental concept. If empirical results and the mindset behind growingly diverge there is only one consequence we can draw. It is the mindset which is wrong.

It was no less a figure than Einstein who stated that a problem cannot be solved by the same means that have caused this problem. This notion should be taken deadly seriously in our respect of a global culture that increasingly endangers its own future by ignoring the writings on the wall. Our underlying paradigm is at stake. This is the Gordian Knot we have to solve. We have to change the underlying mental paradigm that guides our doing and that rules our thinking.

2. Results and Discussion

2.1. *The Ecological Fall: Man versus Nature*

Since the dawn of the modern age people have been dreaming of deciphering the laws of nature and making deliberately use of their emerging knowledge resulting from this endeavor. By achieving this goal modern people introduced a new interpretation of the ancient Christian *Dominium Terrae*. The initial meaning of our role on earth referring to this spiritual motive was that of a guardian and caretaker. In its light our endowment as conscious and sentient living beings obliges us to take care of the planet and all the living species inhabiting the world. Modern man changed this conception turning him- and herself from a guardian and caretaker into a manipulator and exploiter who uses the newly emerging knowledge exclusively for his and her own advantage. The scientific method that was successfully developed by the pioneers of science like Galileo Galilei, Rene Descartes, Isaac Newton and others was from the very beginning an instrumental tool. It was not developed for its own sake, for the sake of human knowledge, but for the sake of subduing the physical world in a technical and commercial sense. There is a famous phrase that is commonly attributed to the English philosopher and statesman, Sir Francis Bacon (1561-1626), "*Knowledge is power*" (Russel, 2005). It clearly depicts the attitude of the emerging modern society. This power by knowledge was meant as a truly secular power that enables the individual human being to acquire personal wealth and prosperity.

But this intellectual move provided something important in addition which is usually overlooked. As guardians we are connected to the natural environment who act, so to speak, from within its live-giving nexus. As guardians we try to be in sync with nature, its natural processes and rhythms thus supporting the natural processes of life. As exploiters men instead learned to exclude themselves from this nexus by assuming an antagonistic attitude. Man versus nature became the new formula. This was the ecological fall that came along with the modern, scientific awakening. Since knowledge production and its commercial application could not be separated from each other, no one, neither critical minds nor selfish users could escape this process of mental transformation. Over its course humans

subsequently learnt to perceive nature as something outside and even dangerous, that has to be treated like an enemy if unexpected events happen; occurrences that could endanger the hubris of a species who dreamt of literally subjugating the world.

In order to turn this programmatic change of concept into the then successful role-model of modernity, various underlying, conceptual innovations had to be made that reconfirmed each other thus eventually resulting in the fundament and cornerstones of the modern, western worldview. From our present point of view these conceptual elements appear to be the main causes of distress that form the underlying generative matrix of our current global crises.

In the following I will briefly outline the cornerstones of the modern scientific worldview which to a great extent remain unconsidered when it comes to discussing the causes and effects of the current crises. Together these intellectual elements constitute the Gordian knot of modernity. This knot whose very structure is formed by the causatively interconnected cornerstones has to be untied if humankind wants to solve its pressing problems. To find the right means for this endeavor will be the main issue of this book whose central message is an interdisciplinary concept of change experiences. This concept does not only help solve the delineated problem in logical terms, but also provides the reader with a sound methodology that enables her and him to practically take action, independently from his and her cultural background, social status and role and individual knowledge and abilities.

2.2. *Ontological Causes*

Any comprehensive knowledge system of a certain complexity grounds in specific assumptions that relate our capabilities resulting from this system to the primordial questions of our being. One of these questions refers to the ontological status of being. It is about the true nature of being, its categories and their inherent relations. These assumptions that usually stand at the beginning of any organized reasoning, have long reaching and mighty effects since they form the underlying matrix of any doing that follows. Often these mental prerequisites are forgotten thus turning into hidden assumptions that then rule and organize our reasoning from the unconscious.

2.2.1 *The Cartesian Dualism: Mind and Matter*

In our case of the modern, western mindset the gold medal for preparing its key ontological assumption goes to Rene Descartes, a French philosopher and writer of the 17th century (1596-1650). He introduced what became presumably the most influential cornerstone of the newly emerging paradigm. He introduced mind and matter as *the* two ontological base categories (Russel, 2005). According to his contribution there is nothing else than mind and matter. Whatever happens in the world can be either related to mind or matter. In terms of us human beings this dualism turns into mind and body, the latter representing the category of matter. Descartes suggested that the material body works like a machine by being composed of elementary properties that can be measured and that follow the laws of physics. The nonmaterial mind houses like a ghost in the machine (Köstler, 1967) influencing its actions while simultaneously being influenced by the actions of the body.

This dualism freed the newly emerging paradigm from a potential conflict, which could have been detrimental to its evolution. This was the slumbering conflict between the Roman Catholic Church and the upcoming new scientific worldview. Before the advent of science the church hold an absolutely dominant position within the European societies as the established authority regarding human faith and knowledge. The Holy Scripture served as the main explanatory system of the medieval people in this respect.

When science evolved the Roman Catholic Church perceived their first representatives as opponents that endangered its explanatory supremacy. The Inquisition's tribunal accused Galileo

Galilei (1564-1642) of heresy because he dared to question the explanatory supremacy of the church by introducing the scientific means of producing knowledge as an alternative to the hermeneutic method of religious knowledge production.

Descartes' dualism offered a way out of this evolving conflict. Subdividing the world into two categories, he paved the way for a peaceful coexistence of both science and church. Science became the advocate of matter while the church kept its supremacy over the human mind. This Cartesian peace enabled the newcomer science to grow and to eventually turn into a serious societal factor that shaped the future development of the modern culture in a unique way. "Modernity" and "scientific" became two synonyms. We are *the* scientific culture that relates any serious question arising to the scientific method of problem solving.

But any method has a limit that can't be surpassed by its own means. A hammer is a means of driving nails into a piece of wood. But you can't brush your teeth with a hammer. A screw-driver is a means of turning screws into a piece of matter. But you can't use it for combing your hair. Similarly the modern scientific method is a perfect means of analyzing and exploring matter. But you can hardly use it for analyzing non-matter issues like the mind.

When scientists turned to exploring the human mind at the beginning of the 20th century they did it by applying scientific, i.e. analytic-materialistic methods of analyzing and describing. If you read through Sigmund Freud's oeuvre you can find many physicalistic analogies resulting from his highly educated and talented mechanistic mindset. Although Freud has been a great innovator by turning human interest to a hitherto blind spot, he did it as a traditional western scientist thus trying to decipher the material aspects of the human psyche. In that respect he was very successful since he managed to found a new scientific discipline that led to many extraordinary and fruitful discoveries; in the consequence his feat even led to a branching within this new scientific field. But still these discoveries relate to an analytical, mechanistic mindset and in that respect the non-materialistic aspects of the human mind remain unsolved. Human consciousness for example appears to be such a non-materialistic aspect which defies any materialistic attempts of analyzing it.

What I want to express is that modern scientists are caught in a methodological trap that dates back to the beginning of modern science. As long as this trap is overlooked or ignored, scientists can't help missing their goal of going beyond the limits of their own approach.

Descartes made it very clear that mind and matter are indispensable ontological categories which cannot be replaced by each other. So we can't reduce our current problems to only one side of this dualism, purely because our one-sided methods suggest doing so. On the contrary, we have to say that the true cause of our global problems rather corresponds with the mind-side of the Cartesian dualism. There is a serious reason to address the human mindset as the real problem. Our daily behavior results from what we have learnt in the past. And these results are stored in the neuronal archives of our minds.

The global crisis is a mind-issue in the first instance. Our real problem is that we members of the scientific culture know how to deal with matter-issues; but we don't know how to deal with mind-issues.

This line of thought does neither mean that the church has to take over as the historical representative of the mind; nor does it mean the opposite, that the church shouldn't do it. This line of thought has nothing to do with the Cartesian peace between societal institutions. It goes far beyond this historical issue. It rather means that we have to overcome the Cartesian dualism by replacing it with a holistic and unifying worldview that nips the problem in the bud.

Ontologically we have to start from scratch. *There's only one issue in the world*, says Master Nan, the Chinese Zen-master. *It's the reintegration of matter and mind* (Scharmer, 2009).

Recently I have been invited as a speaker to a cultural transition conference in Sweden. Over the course of this conference approximately 200 presentations were made from scientists of different disciplines. Going through the conference booklet during breakfast I tried to categorize the presentations from a Cartesian point of view. The resulting statistics were truly astonishing if not shocking. 186 lectures could be related to the matter-side. 11 presentations were not allocable (at least the short descriptions included in the booklet did not allow a clear decision). Only 3 presentations including mine related to the mind-side. That really blew me away.

The true problem behind the crisis could not be disclosed clearer than by this statistic. This conference did not take place sometime in the past. It happened June 2011 including professionals from all over the world. Great people, great minds who all (have been educated to) suffer from the same cognitive blindness: not to look into the ontological mirror and to re-detect and see their own minds as the exclusive and unique source of thought and action.

Our real problem is our own blindness regarding the ontological prerequisites of our own doing, our scientific doing and our doing as laypeople that is deeply affected by our scientific mind and method. I know that this sounds pretty provocatively. But it is the truth that necessarily appears, when we withstand our professional bias by opening our eyes and turning to the ontological prerequisites of our doing.

2.2.2 Analytical Reductionism

Like his scientific founder colleagues Rene Descartes' believed in an analyzable world. This idea of gaining knowledge by dissecting physical entities into their building components ("atoms") was introduced by the ancient Greek philosophers (Russel, 2005) and then reinforced at the dawn of modernity by the French philosopher René Descartes (Capra, 1982). The ancient Greek term *analysis* means to *dissolve* an entity into its constituents. Any physical entity is composed of elements. If you want to find something out about the world and the entities in it, you have to investigate their respective constitutive elements, i.e. properties of extensions and motion that can be measured and described in mathematical, logical terms.

Over the course of approx. 400 years, let's say from the beginning of the 17th century up till the end of the 20th century this analytical method proved extremely successful. It provided the emerging modern society with both the knowledge and the technical means that made its extraordinary evolution possible. Our current complex materialistic knowledge about the universe and its diverse constitutive entities including our planet earth and us humans in it would have been impossible without the scientific method.

Not to forget that this method provided an ever evolving picture of our human body that step by step disclosed subsequent levels of complexity. It started with an anatomical picture showing the organs and tissues as the operational units of the body. Muscles and bones became the role-model of this mechanistic conception since it was their obvious interaction that made the parts of the human body move like the limbs of a puppet on a string. Thanks to the invention of the microscope the cellular level soon superseded this purely anatomic view and delivered a new vision of the physical body. *Omnis cellula a cellula!* This slogan, coined by Rudolf Virchow, a famous German physician of the 19th century introduced the new believe in the cell as the biological atom of both human and natural life. But the analytical train of dissolving matter into ever smaller units did not stop working at this point of history. Human bodies consist of organs, organs consist of cells, cells consist of cell-

organelles, cell organelles consist of molecules, and so forth. Molecular biology is the recent non-plus ultra of the bio-analytical approach. Ultimate biological knowledge has to be expressed in molecular biological terms that describe the chemical mechanisms of life (e.g. the genetic-code, protein-biosynthesis etc.).

But despite its complexity of information and knowledge the picture that we hold in our hands still does not include anything else than matter; particles of different sizes and dimensions that are ruled by elementary physical forces thus bringing forth the material world.

As I said before, any method has its specific range and limits. Since this analytical method was introduced for the sake of mechanistic knowledge it only refers to one side of the coin, namely the material aspects of nature and being. The triumphal march of science misled the people to mistake the underlying method for the ultimate solution of human knowing.

Philosophically this mistake of reducing everything to materialistic causes and units is symbolically referred to as the nothing-else-buttery (Lorenz, 1986). Ontologically reductionist addicts, like many of us are, treat the world as if there were nothing-else-but material bodies and mechanical forces in it. Matter in motion is the mantra of this reductionist approach whose obsessive quintessence is a physical world-theory, a Grand Unified Theory that includes everything in it thus reducing any event, be it a chemical, a biological, a social or any other type of event in the end to physical causes.

The reductionist approach remained not unopposed over the course of the history of modern science. Among others there was a fierce debate among bio-scientists that culminated at the turn of the 19th century. Two opposing groups came into conflict, one favoring the mechanist philosophy, the other favoring the doctrine of Vitalism, which negated any causative interrelation between the processes of life and the laws of physics and chemistry. Out of this conflict evolved eventually a new knowledge discipline by the name of systems theory (Bertalanffy, 1968). Other than the reductionist model of classical science, systems theory suggested a holistic approach instead by connecting two generative aspects inherent in any composed entity: its elements and the relations existing between these elements.

Let's take a closer look at a seemingly trivial phenomenon like water that demonstrates the explanatory value of this new approach. According to its chemical formula H_2O water consists of two different elements: hydrogen and oxygen. At sea-level and under normal temperature each one of these elements takes on a gaseous phase. In the moment these two elements connect the phase abruptly changes. The molecule resulting from this reaction takes on a liquid state. This different quality cannot be directly deduced from nor reduced to the individual components. Neither hydrogen nor oxygen displays a liquid status under the given circumstances. It is a system effect that occurs by resulting from the specific relation(s) existing between the individual atoms.

Similar system effects can be observed abundantly throughout nature. Life itself, for instance, is doubtlessly a system effect. Life cannot be reduced to individual molecules even if these molecules are indispensable components of the living cell. The DNA alone although being essential for any living cell is an inanimate molecule. Isolated proteins, although playing a vital role in the cellular metabolism are inanimate molecules. Lipids in a test tube, although being important units of the cell-membrane are inanimate chemical molecules. This list of essential but inanimate chemical constituents of life could be continued almost endlessly. Life emerges abruptly under the circumstances of a certain molecular regime defined by the relations of its molecular components. We will return to this system theoretic view later again, when we prepare the theoretical grounds for the change experience concept presented in this book.

To cite another example, let's turn to human consciousness again. Like life, consciousness appears to be an irreducible phenomenon resulting from the relations of the system within it appears. Human consciousness hitherto withstood any reductionist attempts of decoding this unique phenomenon by applying purely materialistic means of understanding. It is neither a physical phenomenon, nor a chemical phenomenon, nor can it be related to specific anatomical regions. There is no specific location in the brain where consciousness is produced like energy in a power plant or like a synthetic compound in a chemical retort. Consciousness seems to be a non-locatable quality of a living process system thus resulting rather from the relations within the system than from individual elements. We will return to this line of thought later in the book as well again.

Systems theory appears to open a way out of our reductionist dilemma. It helps the investigator escape the trap of one-dimensional, mechanistic reasoning by focusing her attention on 2 corresponding aspects in parallel. But Systems Theory has not reached the laypeople's minds yet. Hence it plays no role in the daily behavior of the people, either locally or on a global scale. Systems theory thinking and acting still remains the privilege of an extreme minority restricted to specific research communities on the university level. The laypeople's minds are still purely reductionist organs of decision. Analytical reductionism continues to be *the* paragon of human knowledge.

This obvious lack of systemic awareness among the members of *homo sapiens* appears to be a major problem under the current circumstances of a worsening human biosphere. People with a systemic awareness are more inclined to react appropriately than those without, who rather stick to their reductionist bias by ignoring the signs on the wall. Climate change can be easier perceived as a threat if the underlying mental disposition favors this understanding by providing the laypeople with mentally appropriate, i.e. systemic tools. It is far more difficult for those who lack this mental ability and tool to anticipate the systemic effects and to understand the causative context between human behavior on the one side and natural feedback on the other. The current climate scenario is a classical systemic effect resulting from the interrelation between human action and natural processes surrounding us humans. This non-linear interrelation can be more easily ignored if the mental tools for deciphering this feedback-cycle are missing.

Those who lack any systemic awareness, and I think that a great majority of people does it, are literally unarmed in cognitive terms. They are mentally and perceptually defenseless. Hence selfish politicians and mindless entrepreneurs, who recklessly pursue their individual goals, have an easy job of it. When they try to influence people in their stubborn interest by downplaying the real threats, people have no means to hold against it.

It is hence absolutely indispensable to empower people by helping them gain a systemic awareness that surpasses the one-sidedness of the reductionist worldview. We should not forget that especially within democratic societies it is the people, the ordinary people outside the stakeholder's territories who decide upon their own future. Regular elections enable laypeople, i.e. the mass to intervene and influence the political decisions that necessarily prepare the legislative framework of societal and individual change. It is again the people who put pressure on the politicians and the institutions to further evolve correspondingly and to retroactively support the transformation process and make it happen. We should clearly see that in the end societal transition can only occur if the majority of people stand up for it. If any relevant efforts in this respect are left to politicians and stakeholders, who are a considerable minority, change will hardly occur. There will be no societal change unless the majority of people actually wants it.

Any societal change in the past needed the masses to occur. There would have been no French revolution if the ordinary people had not mounted the barricades. And there would have been no social

achievements if the ordinary people, the workers had not mobilized by organizing themselves and becoming a societal factor that could not be ignored any longer.

To engage the people globally in a joint learning process towards a systemic habitus is therefore essential. A systemic awareness appears to be a key motivator of joint action that would help the people do what is needed in order to make change happen.

2.2.3 Structuralism - Solid Structures Everywhere

A reductionist, materialistically biased mind tends to perceive the world as a huge collection of solid, physical units that function in a way like the mechanic components of a bicycle do. The founders of science have conceptualized the world as a huge machine whose functions can be derived from its individual working parts. This unmitigated, mechanistic conception favors a bias that creates a corresponding picture of the world in the minds of the people, laypeople as well as professionals. According to this picture the physical world consists of solid objects that due to their physical characteristics assemble the world machine as a complex and kinematic mega-structure.

Those who believe in this picture have great difficulties in understanding the real process nature of nature. To switch from a structural to a process oriented view is extremely challenging if you are not used to process-thinking and if you never had the chance to learn it.

Over the course of our educational lifetime the reductionist, mechanistic view predominates by far. Again and again we train ourselves in mechanistic abilities. Analytical disciplines like mathematics, physics and chemistry are dominating educational curricula whereas process oriented subjects like arts or sports that could teach us a different worldview, awareness and ability get more and more repressed. If we then get the chance, or even more, if we then are obliged to choose between a structural approach and a process oriented one we are unprepared. We therefore reflectively choose the first option due to our lack of appropriate process abilities.

We even do not change our perspective if we deal with ourselves in terms of our health, for instance. Conventional western, allopathic medicine is based on a deeply mechanistic approach that nourishes the reductionist bias of modern people. It is the doubtless success of hard disciplines like surgery and emergency medicine that support this bias. We perceive ourselves as an assembly of organ and tissues, which like the parts of the watch on my wrist, build up the human body. But this is utterly wrong. The human body is a complex network of interdependent, molecular processes that constitute the living organism. Any individual, human cell out of between 10^{13} to 10^{14} body cells in total is made of processes. Any human cell is a self-organizational, autopoietic unit (Maturana and Varela, 1989) that underlies a constant flow of molecular exchange.

And like the human body everything else in nature consists of processes. The fundamental elements of nature are processes that organize themselves. There are no solid components at all. Even the seemingly metastable entities of inanimate nature like rocks for instance underlie a constant process of molecular flow; processes like degradation and erosion are counterbalanced by constant geological metamorphosis and magmatic building processes. The world turns out to be a huge network of intricately interwoven processes and process rhythms that lack any eternal solidity.

Although relevant process data are available in the meantime that tell a different story the majority of people has not overcome its anthropocentric bias. Due to our specific human conditions we neither can perceive the longtime processes that underlie the metastable structures of inanimate nature, nor can we access the processes of the microcosm. We literally can't witness the mineral flows that shape the surface of mother earth, nor can we see the incessant molecular processes of life with our naked eyes. Hence we still believe in a primarily solid planet with primarily solid furniture in it because this is

what it seems to be in perceptual terms. How can one solid object have an impact on the other as long as they are not colliding in a physical sense? So why should it make a difference if we blow our waste into the air? Why should we care about our environmental behavior?

Referring to the term *waste* above the reader might argue that there is nothing “processual” in it, nothing that reminds us of the intrinsic process nature. Yes, I would agree. Language makes life not easier in this respect. Languages use specific structures to convey their messages. The (meanwhile global) English language I am using for example consists of the following base categories: subject, predicate, object. Whenever I speak about a specific physical entity like waste I do so by using a noun to express it. Since we have learnt to refer nouns to stable and solid entities we can’t help making automatically this ontological mistake. In order to describe the underlying process nature of everything more appropriately we could use verbs for expressing our thoughts instead. But this would completely change our language abilities. We cannot escape or change our linguistic rules from one day to the other. The evolution of language is a long term process, hence we have to accept and to deal with these unsuitable conditions that our language imposes on us. The only thing we can do is to be aware of this trap and to develop a process oriented mind despite our misleading linguistic conventions.

A process oriented perspective would ease our understanding of current, threatening events such as the greenhouse effect and the increasing Ozone depletion that are caused by interfering molecular flows. We would literally expect that any human doing as one flow factor within a complex system of flows necessarily has an impact on other factors.

Historically a process oriented view was firstly introduced by the ancient Greek philosophers. So the goal that has to be achieved is nothing new in principal terms. The aphorism *pantha rei* (Everything flows) is attributed to the pre-Socratic philosopher Heraklit from Ephesos on the coast of Asia Minor. He is famous for his doctrine of change being central to the universe. But his pre-scientific approach did not prevail among the many competing ideas that occurred during the Greek awakening. What prevailed and was nourished over the course of the middle ages and what then was adopted by the founders of modern science was the structuralist theory we are suffering from now.

2.3. Epistemological Causes

The ancient Greek philosophers have introduced two elementary categories of reasoning and questions that since then have provided for a never ending series of disputes. These two base categories are ontology and epistemology. Ontological reasoning refers to the nature of what exists. Epistemological reasoning instead refers to the nature, scope and limitations of knowledge (*episteme*, gr. = knowledge). How can we know about what exists? Since ontological questions can only be dealt with by using our existing knowledge, epistemology can be rated as the underlying discipline. Logically epistemology precedes ontology. Hence it is the fundament of everything (we do as cognitively gifted beings).

(As we will soon see below, this interpretation appears to be a little superficial and shortsighted owing its appearance a far too simplifying and an unjustified linear logic. Epistemology and ontology rather seem to be mutually interdependent concepts than hierarchical elements of human reasoning.)

Why is it important to discuss the fundament of our cognitive being? The reason for this is obvious. This fundament tells us about the value and the scope of our knowledge. Since our doing roots in our knowledge and it is undoubtedly our doing that causes the problems we are dealing with, we eventually have to question our knowledge. And this questioning has to start from scratch when we want to be sure that we have checked everything in the course of our critical reasoning. Hence it inevitably has to start at the epistemological beginning.

2.3.1 *The Subject-Object Dualism*

As I said before, the introduction of epistemology has provided mankind with a ceaseless dispute bringing forth different ideas, theoretical approaches and concepts. Since there is abundant ontological literature available and since I do not want to unnecessarily stress the reader I will try to briefly outline the main ideas and concepts in the following that have come up over the course of this debate. In doing so, I will concentrate on three concepts that exemplarily mirror the main directions that the arguments have taken in this field of discussion.

But priorly I would like to outline the overarching epistemological problem that serves these three concepts as a reference point. This is the so called subject-object problem including the question of their specific relationship. It is a longstanding philosophical issue which has been raised among others by modern philosophers like Kant, Schelling, Hegel. And not to forget the German Psychiatrist Karl Jaspers (1961) who introduced the term subject-object split half a century ago; it mirrors the common view of modern men of a subject that is physically separated from the world thus becoming the object the human mind portrays. Although literally not referred to as such the subject-object problem already appeared in the reasoning of the ancient Greek philosophers. And it was also discussed outside the European boundaries, in the Vedas, the earliest sacred texts of Hinduism and in several schools of Indian philosophy including Buddhism.

Logically it can be derived from the Cartesian mind and matter dualism. There is a mind, specifically the human mind and there is the material world surrounding this mind. In order to facilitate successful behavior the mind provides the body with information about the material world. The ontological categories mind and matter translate so to speak into the epistemological categories subject and object. There is a knower – the subject - who knows about the world – the object. By providing its body with information the mind turns into the subject while matter turns into the object which the information is about. The point of interest now is the specific, epistemological relationship between mind and matter, respectively the relationship between subject and object.

Why is this relationship so important to decipher? It is important because it tells the knower about the value or quality of the information her body obtains from her mind. Can this information be trusted? Is it reliable? To what extent is it reliable? What actually does it tell the knower about the world around her? From the point of view of someone whose daily life and survival depend from the available knowledge these questions appear to be at least worthwhile to be considered.

So let's consider the relationship by turning to the three epistemological concepts mentioned above. These concepts are the so called Naïve Realism, the Hypothetic Realism and the (radical) Constructivism.

The Naïve Realism says, there is a world outside and we learn about it through our senses. Our senses work like a mirror that reflects the individual components of the world thus creating a 1:1 copy of it in our mind. Or to put it more technically, naïve realists see the human brain like a photographic mechanism; it makes a pictorial reproduction of the world and projects it onto the inner canvas of the human mind. There is a tree outside which by being photographically depicted in our minds reappears on our mental canvas. The mental tree is the perceptual copy of the real tree outside. This representational epistemology still seems to rule the reasoning of many modern (ley-)people. If you ask ordinary people on the street they will likely give you a corresponding answer. Their explanation will likely resemble in one or the other way the epistemology outlined above.

The Hypothetic Realism instead has paid its tributes to the huge amount of scientific data from different disciplines. Over the course of the last 100 years these data have clearly falsified the epistemology of the naïve realism. No photographic mechanism could be found in the human brain. There is no film producer or film producing equipment inherent in the tissues of the cerebrum or in any other part of the neuronal mass occupying the cavern of our skull. Not the slightest scientific hint could be detected that would justify the concept of naïve realism; no morphological, no anatomical, no histological, no chemical or any other disciplinary hint; no hint at all does exist.

Due to this lack of a neuronal, photographic mechanism the Hypothetic Realism arrived at a different conclusion. There must be another way of gaining relevant knowledge about the world outside. If there is no direct access for our knowledge producing system, the knowledge then could stem from an indirect, cognitive approach. Our mind does not picture the world like a film-camera, but forms pictorial hypotheses by connecting the sensual data it perceives. These hypotheses are tested by practically interacting with the environment and by using them as a directing means in the course of these interactions. Successful interactions are taken as proof of concept by the hypothetic realist. In the case of successful behavior the underlying hypotheses are said to represent relevant aspects of the environment. Like the naïve realism the hypothetic realism speaks of a representational kind of knowledge. Successful interaction is based on perceptual patterns that positively represent relevant aspects of the outside world. By subsequent successful interactions any learner gains knowledge about the world in a representational sense. But it still remains hypothetical, since there is no chance, to compare any perception with the cause in the real world that has triggered the perception (Glaserfeld, 1987). We cannot step out of ourselves. We can only test our hypotheses through recurring interaction again and again. Each successful test is perceived as a positive proof of concept thus turning the representational hypothesis bit by bit into something that is perceived as truth.

The hypothetic realism was strongly supported by the evolutionary epistemology developed by Donald D. Campbell (1974), Rupert Riedl (1980), Konrad Lorenz (1982) and Gerhard Vollmer (1983) in the second half of the 20th century. The cognitive apparatus of any living species is a part of the organism that underlies natural selection. Hence the cognitive apparatus itself and its abilities underlie the evolutionary process of natural selection. It appears evident that only those survive whose cognitive abilities represent relevant aspects of the world the species are living in. Species with better representational abilities outcompete those whose representational abilities are worse. In other words the evolutionary process can be understood as a constant progression towards a better pictorial representation of the world.

The constructivist position now renounces any representational interpretation of human knowledge. Knowledge neither represents the world as is nor does it represent specific aspects of the world. It rather has to be conceptualized as a process of correlating internal processes with external events that lacks any representational effect. Through repeated concurrence of specific internal processes and specific external events the learner learns to identify the latter with the first. There is no need to discern the world in a pictorial sense or by reproducing specific aspects of it by neuronal means. It is sufficient if the organism reliably identifies recurring external situations by recurring internal processes and using this ability for acting successfully. The radical constructivism replaces representation with identification by repeated correlation of specific internal and external processes. Maturana and Varela (1989) speak in this respect of the *structural coupling* of two operationally independent entities, the organism and its environment.

The following example might be of help in this respect. Let's assume we are capable of applying the Morse code. We then know that · – identifies the letter "a". The interesting thing is that · – has no

pictorial or structural resemblance with the letter it encodes. • – and “a” are two completely different perceptual entities. Independently from this dissimilarity one perceptual entity now unfailingly encodes or identifies the other. The two signs are structurally coupled; they are correlated thus functioning as identification means for each other. • – encodes or identifies “a”, “a” encodes or identifies • –. This fixed correlation facilitates a reliable, mutual identification without any resemblance between the tokens.

The interrelations the constructivists are speaking of in terms of the subject/object relationship are of a similar quality. The subject is able to identify the object respectively recurring object related events by repeatedly concurring, correlating internal processes. It is the subject that organizes these processes by its inherent self-organization ability. In the case of us human beings this subject consists of $10^{13} - 10^{14}$ cells. The process we are speaking of results from the permanent coordinative interaction between these cells. Cells coordinate each other thus forming temporary patterns of metacellular interaction (Frank, 2011). I will touch on this later and more extensively again in the main section of the book. Any specific internal process relates to a specific temporary pattern of metacellular interaction. It appears to be reasonable to maintain that these metacellular patterns themselves have no correspondence in the outside world. Hence they can only serve as a means of identification by concurring correlation, but hardly as a means of representation. This is the standpoint of the epistemological constructivism.

What are the main consequences to be drawn from these concepts in our current respect? I think under our current circumstances of a global crisis there is one issue of real importance.

Any realistic epistemology independent from its specific characteristics, focuses on a representational conception whereas any constructivist position has given up this assumption. Any representational conception now has one necessary, logical consequence. It inescapably leads to a competitive notion of knowledge. If there is an outside world and this outside world is structured in a specific way, correct representation or better, truth becomes a decisive issue. In other words, if there are two or more different representations of one and the same outside factor competing with each other, only one can be correct thus becoming the true type of knowledge. This outside factor is at it is; it exists only once in its specific manifestation, the tree in front of my window, the rose in my garden, the apple on my plate. Hence in terms of competing representations there can be only one correct representation, if at all.

Assuming a representational attitude automatically results in the question “who knows it better?” It automatically results in an intellectual approach can be referred to refer to as the *epistemological reductionism* (Dettmann, 1999). Epistemological reductionists tend to reduce human knowledge to finding out true answers by asserting that there can be only one, ultimate truth (one true representation of the outside world and its components). Among others this is the reason why some physicists are desperately looking to develop the Great Unified Theory which they hope will explain ultimately everything.

2.3.2 Darwinian Epistemology

We have touched on it above already when we mentioned the evolutionary epistemology. Darwin introduced the concept of the evolution of species by natural selection. The evolutionary epistemologists have expanded this concept by including the cognitive abilities of species and of men in this process of constant development. Since these evolutionary epistemologists were declared hypothetical realists as well, they melded two intellectual concepts: their epistemological concept as hypothetical realists and Darwin’s concept of natural selection. In the moment this happens, when

representation epistemology and selection principle are connected there appears to be only one, inescapable, logical outcome of this intellectual fusion. It is the belief that ultimate truth is possible by selecting the more advanced representation from the less appropriate ones.

This Darwinian epistemology eventually became the role model of human knowledge by transferring it to the cultural level of knowledge production. In a nutshell the resulting Darwinian ontological reductionism says that like the knowledge of species human knowledge underlies a constant process of selective improvement eventually leading to the ultimate truth.

One serious problem arises, if we accept this epistemological premise. How do we deal with the fact of culturally different types of knowledge? How do we deal with the fact that different disciplines and knowledge regimes (cultural ones and institutional ones) have developed quite different pictures of one and the same outside world? As epistemological reductionists we cannot help forcing ourselves to assume a selective attitude that guides us to find out the best (the one that fits best) among the competing approaches.

Any kind of realism (the naïve realism, the hypothetic realism or any other type of realism like the critical one which we have not touched on in this discussion) turns the human being who has adopted this concept into an epistemological reductionist. In many cases this process of adopting one's epistemology and becoming an epistemological reductionist appears to happen unnoticed. If you ask people who by communication turn out to be realists in one way or the other, about the knowledge related conclusions they have to draw from it, their answers are telling: usually they are not aware of these conclusions. They are not aware of the inherent epistemological premise that guides and channels their reasoning.

From my point of view the current situation of a global community under threat of social and ecological crises, is stamped by an interesting, inherent logical contradiction and conflict. Scientific papers dealing with cultural transition regularly claim the necessity of inter- and transdisciplinary work (e.g. Leemans et al, 2009). People of different knowledge regimes should come together in order to jointly find a way out of the crisis. I agree with this claim.

But what can we really do, if the – often – implicit, hidden epistemological assumption points into a direction that excludes any cooperative approach in knowledge terms because the Darwinian epistemological reductionism tends to not accept more than one correct answer. How can we deal with it? How can we as scientists work together with people from other knowledge regimes, with artists for instance or indigenous people without presenting the scientific way as a superior means of knowledge production?

Inter- and transdisciplinarity on the one side and hypothetic realism on the other side appear to exclude each other. To overcome this critical situation of an imminent competitive quest for the one and only ultimate knowledge we have to reassess our epistemological premise thus preventing ourselves of getting caught in the trap of epistemological reductionism. It is a trap indeed that hinders us from achieving the goal we are dreaming of. It is the legacy of a scientific mind that could not overcome its representational bias.

Under the current circumstances it should be a matter of reason to choose or favor the epistemological concept that helps us overcome the problems. We have two epistemological directions we can choose between. One direction is defined by epistemological realism, especially by its hypothetic interpretation. The other direction can be related to constructivism. Any kind of realism is based on a representational premise. Constructivism instead has given up this premise by exchanging it with a purely operational perspective of identifying recurring outside events by the means of concurring inside processes.

If we really want to make use of the richness of human wisdom and knowledge the only way to do it is by giving up the representational premise. This conclusion automatically points into the direction of constructivism. In other words, we have no other choice than picking up the constructivist concept as the suitable epistemological means in our situation, because it frees us from the Darwinian reductionism. It enables us to accept more than one ultimate truth. It enables us to accept a pluralistic interpretation of human truth grounded in intellectual diversity. Thus we learn that one and the same object related aspect can be identified in various ways by different subjects. It makes us susceptible to the cognitive richness rooting in the cultures of the world. And last but not least it helps us work together in an unbiased way in transdisciplinary teams and without putting competitive pressure on others who do not share our scientific methodology.

2.4. Operational Causes

Are there any patterns of change inherent in cultural development? Investigating human cultures over the course of time, results in an interesting observation. There seem to be two different types of developmental phases that regularly follow each other. Cultures can be conceptualized as cognitive regimes based on jointly shared beliefs and values that underlie the doing of its members, their feelings, their perceptions, their imagination, their reasoning, and their communications. At some points in the history of human communities these underlying premises change thus forming a new cognitive regime enabling the community to reorganize their knowledge and their practical abilities derived thereof. The American physicist and philosopher Thomas Kuhn refers to such transformational processes as paradigm changes. Although his work primarily refers to the structure of scientific revolutions (Kuhn, 1972) his concept appears to be applicable to cultural developments in general as well.

Under normal circumstances such reorganization phases are followed by phases of constant differentiation. In their courses the knowledge system of the respective community becomes more diversified by branching new insights from already existing cognitive findings; the underlying premises thereby get continuously reinforced through this growing intellectual coherency and consistency.

As we will be demonstrated later in this book this dualistic pattern of cultural evolution expresses an elementary characteristics of human being. It mirrors the basic principles of human learning. Any cultural evolution appears to be a joint learning process that grounds in the inherent rules and patterns of this deeply human phenomenon.

The differentiation process eventually leads on to an ever growing complexity of the knowledge system involved. This complexity results in a hierarchy of mutually interdependent knowledge-elements. Elements of lower levels serve as premises for elements of higher levels whereby the latter evolve by branching from the first ones. This evolutionary process of (human) learning that shapes the individual knowledge acquisition and that reappears again on the collective, cultural level will be described later in detail. So any human knowledge system is not a hierarchy in the technical sense but rather an organic complex that like the growth of a tree results from continuous branching and differentiation.

Taking this multi-level-complexity into account we might conclude that reorganizations of a knowledge system might differ in terms of their respective ranges. Sometimes the reorganization might refer to specific contexts within the cognitive complex while leaving other associated contexts untouched. But sometimes the reorganization turns into a truly holistic event that involves any of the interdependent contexts and levels. In other words, reorganization processes can be locally limited,

while others have an impact on the whole system. In the case of the latter the whole knowledge system is at stake and the reorganization involves the total complexity including the fundamentals of the human cognitive being.

The current, global crisis appears to address our cognitive complexity as a whole. It appears to be a truly holistic event that even involves the most basic factors such as the ontological and epistemological premises we have discussed before.

In the following we will outline another fundamental element that deeply shapes the modern reasoning and that the same time has to be seriously questioned when viewed from a causative and so to speak “etiological” perspective. I explicitly refer to it as an operational cause. Some readers might argue that the following lines should rather belong to the preceding epistemological chapter since its key arguments refer to a specific idiosyncrasy of our modern knowledge system. I could basically agree with this objection. Anyway, the reason for insisting on my personal classification is simple: I purely want to underpin and emphasize the importance of the following lines.

2.4.1 A Clash of Logics

The rules of modern reasoning date back to the ancient Greek philosophers. The earliest sustained work on the subject of logic is that of Aristotle (384 BC - 322 BC) (Russel, 2005). Over the course of history Aristotelian logic became the dominant form within western thinking. And although its scientific relevance has been relativized in the meantime by the introduction of new concepts it still rules the reasoning of ordinary modern people. If you ask the next best person that you meet by chance a question, you can be sure that her answer will be based on Aristotelian logic. We cannot help reasoning by following the Aristotelian logic. The Aristotelian logic lies at the bottom of the western worldview. It deeply shapes the western mindset and has an impact on everything we are doing.

An essential component of the Aristotelian logic, among others, is the concept of linear causation. A causes B, B causes C, C causes D etc. By applying this concept men learned to successfully investigate nature and to find out about the interplay of forces inherent in planet earth. Linear, cause-effect reasoning turned out to be a highly efficient means of gaining practical knowledge. Thanks to its wide applicability it eventually became the key method of modern human analysis, planning and decision making. It invaded every aspect of modern life, from individual reasoning and behavior to social interaction and institutional performance. Eventually it left an ongoing imprint on the industrial production processes of modern societies. Modern life and linear logic are almost inseparable. Whether modern humans deal with private or institutional issues, whether a judiciary wants to convict the delinquent or judges let justice prevail, whether a teacher settles a dispute between students or the students try to explain their controversy, whether a mother tries to comfort her children or her children try to gain attention; they all do so by applying the principles of linear logic. And finally not to forget its impact on the modern mantra of endless economic growth which would be almost impossible without this underlying pattern of reasoning.

When Cybernetics emerged as a new discipline halfway through the last century it added something extraordinary and new to the scientific discourse. It was the concept of non-linearity. This concept turned out to play a fundamental role in understanding of natural self-control and self-organization. Over the course of the following decades it became a synonym of nature and life itself. Cells are non-linear phenomena, constituted by circular processes of molecular interaction; see the autopoiesis-theory of Humberto Maturana and Francisco Varela (1989). Organisms are non-linear phenomena, constituted by circularly interacting cells (Frank, 2011). Social systems are non-linear phenomena constituted by human beings who recursively interact (Maturana and Varela, 1989). Ecosystems are

non-linear phenomena, constituted by cycles of interconnected autotrophic and heterotrophic processes (Capra, 1996). The biosphere is a complex non-linear phenomenon, constituted by an immensely intricate network of composition-decomposition cycles, energetically fed by the sun and including both animate and inanimate matter (Lovelock, 1978).

However, this new concept enables us to draw a clearer picture of our global plight. In its light the real cause of the current planetary crises can be conceptualized as a clash of two types of logics. There is the linear logic that guides our human doing as a global species on one side. And there is the non-linear logic of nature and life on the other side. By interacting with their environments, humans impose their linear logic on the natural processes thus step by step destroying the non-linear wisdom of planet earth. By applying linear logic to their surroundings modern humans break up the self-organizational processes of nature. In other words, we destruct our own basis as biological beings. As biological beings we are interconnected with and depend from the biosphere. As social beings we have introduced a kind of logic that conflicts with the logic inherent in the biosphere. Our linear logic contrasts sharply with the non-linear logic of life. By blindly applying our human logic of linear reasoning and doing we demolish our own biological existence.

The climate change is a good example in this respect. Linear production means of the industrialized countries have resulted in a considerable increase of specific chemicals in the climate shield of the atmosphere. Under pre-anthropogenic circumstances this chemical shield took on a specific steady state that resulted from the non-linear molecular processes between the biosphere and the atmosphere. Due to the human impact of constantly growing, industrial emissions this dynamic equilibrium has considerably changed in the meantime. The result is a globally increasing temperature level that, despite the many controversial debates, will have a decisive impact on the living conditions of men.

To cite another example I will briefly touch on the problem of overfishing. Under normal circumstances any fish population regulates itself. This self-regulation results from the recursive interaction of at least, to put it briefly, two non-linear processes. There is the complex network of predators and prey relationships on one side. In its underlying pattern this relationship is a deeply circular phenomenon. Since the pioneering work of Lotka and Volterra (1931) about the non-linear dynamics of populations we know that no predator extinguishes its prey because there is an immediate feedback that prevents the predator from doing this. On the contrary the relationship is a systemic one including the effect of mutual regulation.

And there is the reproduction cycle within the species. It is closely associated with ecological factors like temperature, lunar rhythms, food supply etc. These two interacting non-linear processes in the end are responsible for a steady state that enables the involved species to constantly regenerate.

Now the inescapable, linear logic of economic growth steps in. This time the global fishing industry is its merciless executor. By applying its own rules to the self-regulating processes of the ecosystem it selfishly changes the rules of the game. The newly imposed rules ignore any non-linear regiment by rudely replacing it with the linear logic of ever growing human wealth. To put it bluntly, replacing turns out identical with destroying in that case. By imposing our own rules we destroy the life spending, non-linear processes of nature and bring the affected species to the verge of extinction.

There is only one way out of this dilemma. We humans have to familiarize ourselves, our reasoning and our doing with the non-linear logic inherent in nature. We are an integral part of nature. As biological beings we belong to the biosphere and its recursively intertwined ecosystems; hence we necessarily have to deal with its inherent non-linear rules. Ignoring these rules is a suicidal act. We cannot escape our biological roots. We have to accord everything what we are doing with the

nourishing, non-linear logic of life. We have to literally give up our linear idiosyncrasy by replacing it with a non-linear successor mindset.

It will be not enough to technically implement non-linear production processes here and there as we have already begun. The problem cannot be reduced exclusively to technical means of problem solving since this relates everything to the matter side of the Cartesian dualism. On the contrary, it is the human mind that brings forth our life-style and this human mindset is a biological phenomenon in the first instance.

3. Conclusions: How to Cut the Gordian Knot: from Experience Science to Change Science

One important aspect remains that has to be added. The issues we have discussed (mind and matter, analytical reductionism, structuralism, subject-object dualism, Darwinian epistemology, linear logic) belong to one and the same comprehensive system of human knowledge. As such they mutually explain and reconfirm each other thus creating an impression of inescapable consistency and truth. It is this consistency of the modern knowledge system which makes the traditional worldview and mindset so resilient and almost invulnerable. Any singular, new idea that is introduced not only has to fight its traditional opponent inherent in the western knowledge system; it also has to logically withstand the system as a whole; it has to withstand its logical consistency. This task reminds us of the biblical myth of David against Goliath. How can a singular concept set the world in fire if the traditional worldview blocks any innovatory attempt by holding its systemic consistency as a truly unbeatable weapon against it?

Luckily, the myth gives us a clear and positive answer. It tells us: It is doable! Even as David we have a chance against Goliath. Our chance is to find the Archimedian point of action that enables us to overbalance and leverage the giant.

Our Archimedian point is a methodological move shifting our attention from a reductionist to a systemic perspective from the beginning. Instead of focusing on singular concepts as potential elements of a new system we should rather develop the structural nucleus of a new knowledge-system that itself proves consistently enough in order to achieve the impossible. If we develop a new system in a nutshell whose constitutive, logical components refer to each other in a comparably consistent way like the traditional cognitive complex does success appears not inevitable, but at least doable.

I hence will make use of the preceding arguments in the following. The main part of the book includes the outline of a changed knowledge system that could achieve the required task.

Societal transition is a collective experience. This appears to be indubitably. In the course of Chapter 1 I will therefore explain the logical fundamentals and parameters of a Science of Human Experiences. This Experience Science is a new discipline on the rise that I have described recently in two pioneering books (Frank 2011, in print).

During Chapter 2 I will draw the logical consequences resulting from this new discipline from a societal point of view. As a human being I am not alone. Any human existence is a deeply social phenomenon. By living together we transform our biological roots and conditions into the binding rules of joint cultural existence. These biological-social transformations are systemic events creating new frame-conditions for our being that cannot be reduced to their biological roots. Regarding the required global transition towards sustainability we hence have to consider both biological constraints and social constraints. The first ones are dealt with in chapter 1, while the second ones are the topic of chapter 2.

Chapter 3 includes an inquiry about the types of changes within systems. Since we are dealing with a system phenomenon, the change phenomenon itself has to be analyzed as a system phenomenon

displaying the different forms change can take on. As long as we have no clear picture of this phenomenon in systems theory terms we are groping in the dark.

Chapter 4 focuses specifically on human learning which turns out to be the change-form we necessarily have to speak of in our respect. Its specific inherent rules and principles are going to be investigated leading to a classification of different types of human learning that are indispensable to be known prior to any planned and choreographed joint action.

Chapter 5 is something like a synthesis of the preceding chapters by integrating their specific insights from a perspective of practically staging transition experiences. It will outline the main parameters and working principles of undoing the modern mindset and of choreographing change events that lead from the modern life-style to a post-modern successor.

Chapter 6 will describe appropriate examples of my own work as an experience designer and experience dramaturge who has been successfully engaged in the global experience industry for the past 25 years. These examples serve as nothing else than as first proofs of concept that practically point into the direction outlined in this book. Their message is: Yes, change is possible under the circumstances of a changed concept of change!

Eventually I will get back to the questions discussed in the preceding lines of the prolog. The epilog at the end of the book sheds light on these questions from the point of view of Change Science whose cornerstones have been spread out in the foregoing chapters. Does the presented body of knowledge achieve the goals described in the prolog? Can the presented Change

Conflict of Interest

The author declares no conflict of interest.

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