The Drama of This World
- an interdisciplinary framework for survival

Survival and the destiny of mankind have come to the forefront of awareness, not only among experts but also among well informed members of the general public. Regarding myself as being one of the latter, I have written this collection of essays in an attempt to dig a bit deeper into the issue of sustainability and how it is related to the laws of science western culture and our self image.

It is an attempt to go beyond a superficial understanding of our present paradigm of destruction and attrition of the ecosphere; an attempt to look beyond the daily jargon and popular expressions such as sustainable development which is a contradiction in itself.

Superficially it may seem odd that history, religion, thermodynamics and information can be combined to form a common framework, providing a better understanding of our present paradigm. When studying the matter I became aware of how much these disciplines are related to each other. How the creative explosion of man has many causes.

The Creative Explosion of Man, “Chinese Horse” from the Cave of Lascaux, France

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1. Preamble and Authors Foreword

Rationality, the Trap of Modernity

Modernity as we understand it today has had difficulties in accepting spirituality as a separate domain in its own right and on an equal footing.
Although modernity does as a principle[1] separate the value spheres of art, morals and science from each other and has provided the logic for material wealth human rights, equal opportunity etc, scientific investigation has dictated the agendas of art and spirituality, and at times even tried to make the questions they try to answer seem irrelevant.
On the political level the separation of church and state has resulted in the dominance of rationality upon morality, rather than becoming a bipolar force in the consciousness of man.

Modernity's elevation of rationality, allowing it to colonize art and spirituality has reduced modernity to a one dimensional desert of awareness, providing us with a one-sided utilitarian view on man and creation.

History has demonstrated a number of reactions to modernity, some creating scars still visible today. Romanticism and its twin sibling Nationalism failed dismally to integrate the values spheres leaving behind it the artefacts of oppression. Post Modernism being too shallow and superficial is leaving behind a trail of aesthetics, vanity and meaningless consumption.
There is no force today able to cultivate the desert of the mind created by modernity's rejection of spirituality, able to integrate the value spheres into a common concept of being while still respecting their separate characters.

Modernity and Fundamentalism, Siamese Twins

It is therefore not surprising that religious fundamentalism is clashing with modernity, not being able to accept the separation of the value spheres, of art, of science and of spirituality, on an equal footing. Neither is it surprising that fundamentalism cannot integrate the concept of human rights. Fundamentalism claims the exclusivity that rationality once had and still claims it has over the other value spheres, making modernity the image of fundamentalism in its refusal to tolerate other value spheres.

It is also typical that modernity's uncultivated desert, despite rational insight, has not been able to curb man´s total domination and accelerating attrition of the ecosphere.

This dilemma has become all the more apparent as "*We*" [2]attempt to study, understand and communicate the laws of nature and the limitations these impose upon mans capability and right to own and control his destiny.

The limitations and dilemma of rational thought have become all the more apparent as answers to questions that modernity itself creates and deems irrelevant, elude us. Where are the limitations to man and his/her exploitation of the ecosphere? Is the God of man the God of the ecosphere? What are we part of, and what is it that is part of us?

Fundamental limitations found in the sphere of science, thermodynamics, information theory etc impose fundamental limitations on mans existence, and these reappear as questions of

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[1] *Immanuel Kant*
[2] *"We"in the Exergy group of Sigtuna in Sweden, a group of persons from all walks of life, Scientists, Lawyers, Engineers, Management and Clergy etc*

morality in the realm of spirituality. This is simply because the answers to some questions triggered by insight in one domain cannot always be answered by the inherent capability of the same domain. Modernity has not acknowledged this fact, this implicit duality between the realms of the natural world and the spiritual.
Only man trapped in the bipolar fields of both the realms of science and spirituality, being able to integrate their loci in him or she will be able to prioritize and find a way forward into the future.

2. It is about "*This World*"

Science, Rationality and the Awe of Creation
As stated in the preamble, the intent outlined below is to integrate thought about scientific knowledge, society and mans aspirations with the awe of creation. Scientific knowledge is seen only as starting point, the tip of an iceberg pointing to insight that transcends the world of reason and the world of the soul.
Of all the laws of science, few are as omnipresent as the laws of thermodynamics, the collected contributions from Carnot, Boltzmann, Shannon and Prigogine.
All these laws contribute to an understanding of life and must form an indispensable part of mans frame of mind, if he/she is to act as the custodian of creation.

A key concept to this end is information, the link to living systems and to society tying up the second principle of thermodynamics and life.

Essay 1 The coming together of Ideas describing "*This World*"[3] concerns to a great extent the duality between that part of energy which can perform work, something called *Exergy and the structure contained therein, something best described by Information.* Understanding the deeper meaning of *Exergy* and the way it manifests itself brings us a new level of human awareness a deeper scientific and spiritual understanding of the mechanisms behind modernity's built in paradigm of destruction.

When facing the ultimate questions of life, only poetry and art can bring together the world of reason and contemplation on one side with the world of spirituality on the other. *Only a force outside the world of reason can put the science of life in contact with the meaning of life.*

Secondly in *Essay 2 Man, Systems and Society*, I have tried to look at some of the characteristics embodied in the technical systems that manifest themselves as an important attribute of the nation-state. In this essay I have tried to identify separate embodiments of technology and architecture[4], as key parts of our technical systems, where we can identify the root cause of many of our sustainability problems. While technology by definition is the fruit of science, architecture is politics expressed in technical terms. *Architecture embodies the societal relations that man´s dialogue has created in the real world with the aid of*

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[3] *Nobel Laureate Richard Feynman describes the laws of thermodynamics in his 1964 lecture at Cal Tech, as laws about this world.*

[4] *Architecture is here seen as the framework, the skeleton, on which you attach technology. The architecture defines various roles, relationships between stakeholders such as suppliers, producers, consumers, lawmakers, the voting public etc. The architecture enables business models.*

technology. Societal relations manifest themselves in many ways; both abstractly in culture and our legislation, but also in society's physical embodiments. In hierarchical or power related embodiments we find this in the way edifices such as courts, the parliament, and corporate headquarters are designed and implemented. In telecommunications we used to find this in the way the systems were built around one single operator, and nowadays find it in software structure and protocols creating de-facto monopolies. In all these cases, whether legislation, cultural codes of conduct, physical embodiments or software protocols, they all define relations between individuals and individuals or between individuals and organisations, or between organisations with respect to the availability of some legal right or physical resource. In this way architecture and business models become mere reflections of each other, *architecture being the reflection of the inherent intent* of the business model.
This insight means that architecture must be understood in the broad sense defining societal relations and the allocation and control of resources from the socio-political perspective, and hence is a key enabler and important when it comes to defining sustainable systems.

Thirdly in *Essay 3 Thermodynamics, a Drama of "This World"* I have tried to view the laws of thermodynamics as an artefact of human scientific understanding, an enabler of paradigms, a necessary, but not sufficient ingredient of our understanding mans destruction of "*Gods*" creation[5], a moving target inspiring religion, art and politics. Essay 3 constitutes the core of this effort, but cannot be properly understood without the support of the rest.

Fourthly in *Essay 4 The Inner Workings of a New Paradigm*, I try to put the earlier discourse in Essay 2, Man Systems and Society, into a more practical context, where the focus is on The *Re-engineering of the Systems of Society*. Re engineering at the architectural level as opposed to the introduction of new technologies; re-engineering as part of systemic thinking[6], as opposed to simple linear cause and effect.
Re-engineering using architectures based on policies[7] that in their turn are based on Ethical insight rather than neutral systems built by technocrats, void of values, satisfying only particular interest groups narcissism[8]. Re-engineering the value chains from a more holistic viewpoint, having ramifications on our patterns of production and consumption, how we organise ourselves. In the deepest sense it concerns the re-engineering of modernity itself.
I have coined the term re-engineering to reflect our engineering society's systems and the vast re-structuring of production and distribution processes that awaits us.
Finally it is important to point out that re-engineering is a structural not a technological concept. It is primarily about establishing relationships between and controlling the flow physical entities, rather than focusing on the technology of physical entities themselves.

Lastly in *Essay 5 The Children of a Creating God*, I have tried in short and superficially to compare the major religions from the viewpoint of creativity. I have claimed, and this can of course be disputed, that our unique hedonistic culture of creativity and freedom unbridled by Justice and Righteousness, has been allowed to run amok, leading ourselves down the path of self destruction. The rational brain of Athens has been allowed to

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[5] *I purposely use the word of God here, not as a blasphemy, but to stress an important personal insight, that non linear thermodynamics is as close as we get right now to the mechanisms that have created life as seen with the eye of the flesh and the eye of the mind..*
[6] *Understanding the importance of Statistics and non-linearities is at the core of systemic thinking*
[7] *Policies are rules. If an architecture is built in a way that permits the enforcement of policies, then rules can be enforced when it comes to the distribution and sharing of resources within that architecture etc*
[8] *Narcissism is taken from the Greek myth of Narcissus, who drowned in his own reflection, so infatuated by his own beauty. In the spot a daffodil (in Latin narcissus) is said to have sprung.*

run amok undeterred by the spirituality of Jerusalem; the insight of Ahasverus has not tethered the spark of Prometheus.
Other religions, such as Hinduism, Confucianism, Taoism, Buddhism and Islam have wandered down a different path.

Finally; the last section just reiterates some of the insights that have emerged in the earlier essays and highlights a few statements that the author of this effort would like to contribute with to a Manifesto "*in spe*".

I have tried to keep separate the domains of science, art and spirituality, meaning the domains of logic, self expression and spirit. Wherever these are linked, it is not because I have confused the domains but rather an indication that a single domain is not sufficient to describe the multidimensional issue in question.
I have added as many footnotes as I considered necessary, and have tried in this way to make the text self explanatory.

3. The coming together of Ideas, Essay no 1

3.1 Setting the Stage

A devouring culture
Western culture, coined as modernity, today dominates the world. Its pattern of thought permeates all cultures, even the ancient cultures from Asia and the Middle East have succumbed to its seduction. The force of western civilization is overwhelming, never in the history of mankind has there ever been anything like it. The footprint of evolution and of history, information[9] captured and stored in the biosphere, in cultures and languages, in the ecosystem, in plants and animals, are being consumed by the force we call western civilization.

If wealth is defined as the information diversity available to us, then we are indeed becoming poorer. If wealth is defined by the amount of material wealth we can amass and consume, then we are becoming richer.

I will endeavour to explain this below.
Exergy and its Cousin Information Foundations of Life
One of many ways of linking information to Energy is via the structure of the matter that contains Energy. For example a piece of charcoal contains structure that will be destroyed if that piece of coal is burnt, or meat contains structure which is destroyed by the flesh eater's metabolism. Structured matter containing Energy that can be released to the surrounding and in that process performs work is called *Exergy*.
All structures contain information about themselves, necessary information to maintain cohesion of the structure itself and in case it is a living structure, then also the information necessary for the maintenance and reproduction of that structure. By this we mean *the information necessary to fulfil the intent of survival for that living creature*.
If we are talking about a living creature that is not Homo Sapiens Sapiens, that is a creature that has *intent to survive, but no awareness* of that intent, then survival is the inner meaning of

[9] *Information is here seen as the micro structure within various structures*

that organism, and the information stored in that living creature has a direct bearing on its survival and meaning.
Most living creatures are part of an ecosystem. In that case strategies related to the communication of information and information carrying capacity within that ecosystem is important for the survival of that system. In short both exergy and its cousin information are crucial for survival.

Hopefully we can now somehow imagine the abstract, but parallel nature of Exergy and Information and its relation to life itself.
The destruction of matter, living or dead means the dismemberment of its fundamental parts, the disassociation of molecular or atomic bonding and re-association into parts containing less bonded energy. *Matter/Energy cannot be destroyed, but the way it is organised can be changed*, in this way energy can be stored or released.
The most obvious process is photosynthesis. Solar exergy provides a flow of photons at three particular energy levels, expressed by the formula $E_x = h^* \upsilon_x$, it tells us that photons with an energy E_x at a frequency υ_x are at work. Captured (eaten) by plants, performing work in freeing oxygen from water and binding carbon in organic matter. In this way "producing" oxygen and *transforming solar exergy into organic exergy*, organic matter that later can be burnt via combustion or be broken down by another creatures metabolism; in this way binding oxygen and producing carbon dioxide, and maybe creating new forms of exergy.
This process of rearrangement is not unique to photosynthesis; all living creatures consume and create exergy. Muscle and fat in a living organism, or beeswax in a collective organism such as the bee colony are just other examples of exergy transformed, adapted to fit into the context of another living being. This context is found in the way matter is structured and the way it enables certain processes, just like the structure of chlorophyll enables the conversion of carbon dioxide and water via photosynthesis into organic matter.
The context however is not only found in the way matter is structured and communicates internally *within* itself, but also in the way it communicates externally *between* similar and dissimilar organisms.

An example of this further context is the way a particular orchid may communicate chemically with an ant, enabling the reproduction of the orchid and the well being of the ant, or the optical communication occurring between the sunflower and the bee, enabling the forming of seeds, spreading of DNA carried by pollen and the supply of protein and carbohydrates to feed the bee pupae ensuring the survival of the bee colony. *We are of course not concerned with conscious communication but communication as part of (unconscious) intent*.
It is important again to point out that *structure, thus information*, contains meaning for the living organism that is able to convert this information into *meaningful intent*. This is true even if the organism does not have consciousness. An amoeba has meaningful intent, but no consciousness. [10]

[10] This argument was first put forward by the eminent psychologist Elliott Jaques in his epoch making book The Life and Behaviour of Living Organisms, Praeger, Westport Conn 2002

The fact sheet below written by Carl Zimmer from Nature 1998 and the picture from Ilya Prigogine´s books, From Being to Becoming, and Order out of Chaos, exemplify the case in mind, how amoebae using meaningful intent get organised for survival. The picture shows us how amoebae create self organised structures under the stress of starvation (10).

All for one and one for all: multi-cellular organisms have arisen more than once, each time through an intricate dance of cooperation and conflict - The Evolutionary Front. *Karl Zimmer, Nature 1998*

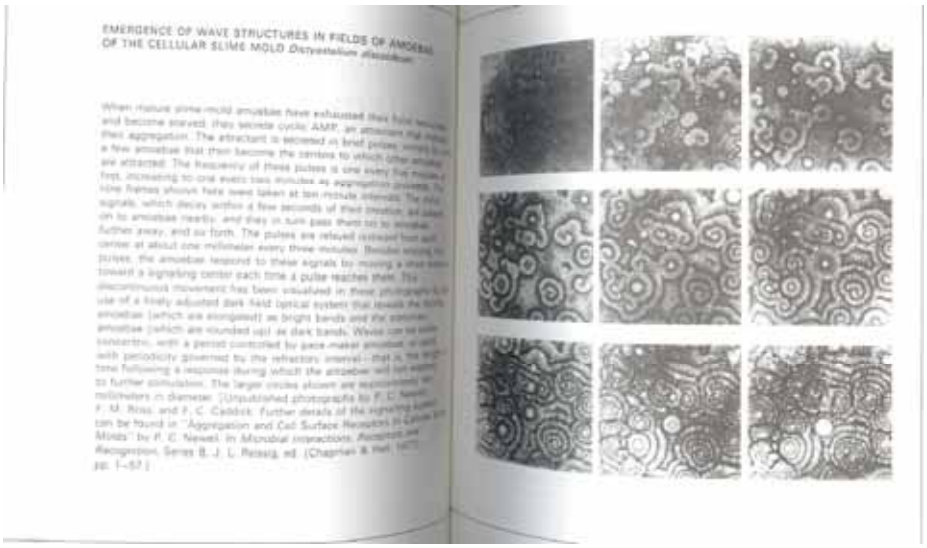
A hundred thousand amoebas can come together to create what looks and behaves like a multi-cellular creature. Is it one of nature's oddities, or a clue to the origin of our complex bodies?

In the early 1950s, when biologist John Tyler Bonnet was just beginning his career at Princeton, he was startled one day to receive a message from Albert Einstein, who worked at the nearby Institute for Advanced Study. Einstein wanted Bonner to come to his office and show him a movie.

The film that Einstein was so eager to see starred an amoeba named Dictyostelium. Normally, this single-celled organism goes about its quiet business of hunting down, engulfing, and digesting bacteria that live in soil. After gorging itself sufficiently, Dictyostelium divides in two, and the new pair go their separate, bacteria-devouring ways. But if the thousands of Dictyostelium in a stamp-size plot of soil should eat their surroundings clean, they do something exceptional, and this is what Bonner had captured on film.

Rather than crawling around randomly, the amoebas start streaming toward one another in inwardly pulsing ripples. As many as 100,000 converge in a swirling mound. And then, remarkably, the mound itself begins to act as if it were the organism. It stretches out into a bullet-shaped slug the size of a sand grain and begins to move. It slithers up toward the surface of the soil, probes specks of dirt, and turns around when it hits a dead end. Its movements are slow--it would need a day to travel an inch--but in a stop-action film, such as the one that Bonner showed Einstein in his darkened office, the deliberateness of the movements eerily evoke an it rather than a they.

After several hours, the Dictyostelium slug goes through another change. The back end catches up with the tip, and the slug turns into a blob. The blob stretches upward a second time, and now some amoebas produce rigid bundles of cellulose. They die in the process, but their sacrifice allows the blob to become a slender stalk. Perched atop the stalk is a globe, bulging with living amoebas, each of which covers itself in a cellulose coat and becomes a dormant spore. In this form the colony will wait until something--a drop of rainwater, a passing worm, the foot of a bird--picks up the spores and takes them to a bacteria-rich place where they can emerge from their shells and start their lives over.



Ilya Prigogine,"From Being to Becoming"
Self organisation of Amoebae during Starvation,
In this suite of pictures we can see how meaning is expressed as part of the intent of survival ;creating information and structure".

The Amoeba like all living creatures is astounding. If we define the total memory **U**nits needed to store the **E**ncyclopaedia **B**ritannica as **1 EBU**, then the DNA in an amoeba can store **1000 EBU**. Is it then surprising that life doesn't need brains or consciousness to get organised? (10)

A piece of carbon has no consciousness, no meaning, but does contain exergy.

All living creatures embody meaning based on intent in the way it is defined above; however only human beings are conscious of their existence. Meaning is a necessary but not sufficient requisite for consciousness.

Mass Destruction of Life Itself

Mass industrialisation means mass consumption of exergy, which in its turn means a mass destruction of information bearing[11] structures, such as fossil fuels, bio energy, but also living creatures such as fish, fowl and mammals. As these resources are consumed, and are not replenished, we will also destroy the awareness, intent, cultures and civilizations that lived in symbiosis, share information with, and profited from, these natural resources. We will destroy the link, the unconscious intent between nature and culture and ultimately we will destroy ourselves.

[11] *Bearing means carrying, in this case information bearing*

So in effect the industrialisation process not only consumes the exergy of natural resources, but also destroys and replaces the incumbent[12] cultures enabled by that natural resource with other structures containing lower information diversity and *an intent that suits our needs*.
In addition, effluents and waste, being the result of the intent of industrialisation, also damage living organisms preventing them to fulfil "*their intent*".
So in effect we are not only talking about mass destruction of information bearing structures themselves, but also the informational diversity, the meaning and possible consciousness contained in them. This is the main reason why species, cultures, peoples and languages are eradicated from the face of the earth at an alarming rate. Industrialisation is perpetuating its own informational structure, ***based on its own intent*** and the values embodied within them at the expense of bio and cultural diversity. It is cultural imperialism down to the level of molecules and DNA whose intent it is to change our environment to fit a short-sighted fossil fuel economy. Examples of this are farmed salmon, broiler chickens, gene modified organisms such as maize and rapeseed etc
Man as a Custodian of creation is redefining the blueprint of creation to fit a short-sighted extraction of resources from the ecosystem.
In practise broilers are made to absorb large amounts of synthetic protein in order to be slaughtered within only a few weeks. These animals, if left to live would die soon from disease or collapse of the inner organs.
Wheat and rapeseed is modified to grow with huge amounts of synthetic fertiliser to give enormous harvest, while at the same time depleting the soil on which it grows, creating desert.
We can see how this new reality, whether we build our economy on fossil fuels or bio-energy, or what, will shape a new insight within us, a new awareness . Some fundamental questions need to be asked and some fundamental questions need to be answered, and it is our duty to take on that challenge.

For who would lose,
Though full of pain, this intellectual being,
Those thoughts that wander through Eternity,
To perish rather, swallowd up and lost
In the wide womb of uncreated night,
Devoid of sense and motion?
John Milton, Paradise Lost 1667-1774

3.2 When it all Began

The Industrial Revolution
The industrial revolution and subsequent modernity in itself is also the result of a confluence of ideas.
The renaissance 400 years earlier set the stage, as it undermined the foundation of medieval Catholicism, by rejecting the earth as the centre of the universe, and the Pope as the representative of God on earth.

The monolithic[13] concept of the messianic age, Jesus as the Messiah and heaven and earth having once again become reunited was the main concept to be challenged and dismembered by Galileo Galilei's astronomical observations (reality), Massaccio's frescoes (art), Brunelleschi's architecture (art and matter) and Dante's Divine Comedy (art and spirit),

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[12] *Incumbent is used to represent, old, existing, priviliged, endowed*
[13] *Single layered, uniform*

creating the foundation 300 years later for Immanuel Kants separation of the value spheres, matter, contemplation and self, and spirituality.

According to the new paradigm man now directed the circus (the divine comedy), with God as onlooker and judge. Man now, unfettered, free to discover the universe, the world, and himself as an independently thinking human being. Galileo Galilei told us the world was not the centre of the universe. Dante told us that man was responsible for himself, in effect the first capitalist, setting the stage for the liberation of man, separation of the value spheres and exploitation of the earth.

Modernity Emerges as Knowledge and Freedom Merge
The stage was indeed set but it took 400 years for the plot to unfold, for the value spheres to separate, and modernity to emerge as man, knowledge and human experience were slowly liberated from the domination of spirituality, and the grip of the church.

As knowledge dissipated and disseminated into society, it amplified the capabilities of those who no more were concerned by the dogmas of the church. The new unfettered Prometheus was set to conquer. Building ships, charting the earth and the universe, inventing navigational instruments, creating mathematical theories, the underpinnings of thermodynamics etc etc… discovering a world un-chartered by the tools of the spirit, a world that could only be discovered by the tools of the mind.

Academie Francaise, Royal Society, new institutions came about forging a link between what was to become the nation-state and intangible assets[14], such as human rights and human knowledge. Justifying falsely the arrogance of the mind in having believed it had conquered the realm of the spirit. Man had now enacted a fundamental transformation in his search for identity, by letting reason colonize the domain of the spirit; Man had now placed himself at the centre of the Universe, unfolding the logic to finally grab the creative initiative from his master modifying the blueprint of life.

By the time of the French revolution 1789, science had come a long way. Cook had sailed around the world and discovered Australia, Newton had published his Principia, Harrison had built his chronometers, and man began to extract energy from fossil fuels, and as the productivity of agriculture improved thanks to farming becoming more effective and better integrated into the ecosystem, it released manpower to man the new factories, the industrial revolution was born; the fruit of knowledge that was to bear the seeds of man´s exploitation of his habitat.

The confluence of freedom and knowledge, in other words modernity, became the engine of wealth, propelling those that were part of it into colonialism in the 18th C, industrialisation in the 19th C and the information age in the 20th Century, leaving the rest of the world as a resource to be exploited.

Access to arable land once having been the prime source of wealth was successively replaced by access to raw materials, manpower, capital assets, and eventually information and knowledge itself became the new prime value creating capital asset separating the haves from the have not's, *carrying within itself the intent to expand and to dominate*.

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[14] *Non physical, abstract assets*

This successive migration of mans awareness from our prime asset, mother earth, via manpower, natural resources, capital and knowledge to a higher level of abstraction has successively alienated us from the roots to our existence, and created *intent* in conflict with the ecosystem, *in conflict with information exchange at the lowest level, creating biodiversity and exergy*.

4. Man, Systems and Society, Essay no 2

Emphasis on the How, Not on the Why

Although the idea of a nation-state and the sharing of power[15] emerged at the end of medieval times as Catholicism's monolithic interpretation of reality collapsed, it was not until the mid 19th C that the idea of the nation-state became pervasive thought Europe, a time when access to labour and raw materials had become the main source of wealth.

Again modernity, having created a one dimensional wasteland of reason, a spiritual desert, proving answers to the how, but not to the why, presented the necessary logic for romantic nationalism to take the centre stage promising salvation with Art, Music, Literature, Philosophy, Education and the Church all converging on a common interpretation of reality; an attempt to reunite that which had been separated, the ethnocentric nation-state.

The creation of an ethnocentric centrally controlled nation-state, deriving its legitimacy from dubious myths from the past, a time where myth claimed the existence of a unified untarnished soul.
Brand names and flags emerged as symbols rallying the population, with the middle class as the foremost carrier of the nation-state concept.

Although romanticism carried within itself the urge to integrate the value spheres and makes man whole again, just as Rousseau in his time, it was hi-jacked by other forces having a more dubious agenda, as the disastrous wars between nations in the 20th C and the holocaust later would prove.

It is therefore not surprising that the fruit of national symbolism and the middle class, discipline, education and innovation are turned towards and have become part and parcel of the integrated nation-state. The middleclass carry the embodiment of nation-state structures such as railways, the telegraph, and the telephone, the radio broadcasting system but also the military, educational and administrative systems; neither would it surprise anyone that the architectures[16] of the communications, transport and energy systems reflect anything but the centralised nature of the nation-state.

My point is that the technical solutions that we have inherited from the beginning of the 20th C reflect the paradigm[17] from that period, with standardisation, economy of scale and centralised control. Not able to allocate resources when needed, these solutions are often wasteful and inflexible, and can only become really effective if the resource owner acts as a monopoly owning the end user, fully loading the infrastructure by putting the end-user in line.

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[15] *Sharing of power between the worldly and spiritual powers forms the cornerstone of the constitution of the modern nation-state*
[16] *Architectures is here to interpreted in the general sense, how resources (space) are(is) subdivided between various stakeholders*
[17] *Paradigm as understood by Thomas Kuhn as an underlying interpretation of reality*

Individual resource allocation is unknown, and any software put in place today is still used to amplify the paradigm of centralised control.

It is important to understand these aspects, which we will return to in a later essay on the re-engineering of society. *It is important to understand that the architectures embodying centralised control have an intent that stands in contrast to the inner workings of nature*.
It is also important to understand that our large technical systems are part sociological artefacts reflecting the needs of the first decades of the 20th C. They reflect the vision of a monolithic nation-state in competition with other nation-states.

Technology is not political, it is derived from science, systems can be partly political, but architecture certainly is political. Architecture deals with the problem how resources are to be allocated and shared between different stakeholders, and what the relationship is between these stakeholders. It will determine, in a general sense, how resources are allocated distributed and controlled, and it will determine the overall delay and efficiency of the system, constraints, bottlenecks and instabilities as seen from a systemic perspective.

Policies as the political expression of intent, putting ecology and the conservation of exergy into the forefront of systemic thinking become then an issue of survival.
If we wish to enforce policies, linking the realm of the *Why* with the realm of the *How*, in our technical systems we must do so at the architectural level not at the technical or the system level. ***Policies express the intent of the system*** and must be integrated into the architectural framework, just as *the intent of the amoebae* is embedded as part of the code in its DNA.

Most politicians do not understand this paradigm, the parallelism of nature and man made systems, the importance of structures built in intent. Many politicians lack an encompassing vision, are obsessed by controlling budgets, laying waste[18] sources and resources of alternative thought.
Many are still obsessed by the narcissistic ownership of resources rather than taking responsibility for, and the ramifications of, structures created by unsustainable policies.
The corollary between life and complex man made structures obeying intent (policies) is astounding indeed; putting the ecological perspective into Re-engineering.

As a contrast to man made systems, living creatures in nature are effective, highly decentralised and strongly integrated in their niche in the ecosystem, information delays are zero, there are few overshoots and resource efficiency is therefore high. More about this in the upcoming essay on Re-engineering of society, but what I am trying to point out, is that architectural principles utilised in our technical systems today is nothing we can build in the future, the turn of the century industrial paradigm is a "Cul de Sac"[19].

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[18] *The Swedish government has recently withdrawn the budget for the Department of Ecological Agriculture at the Swedish University of Agricultural Sciences at Uppsala, the only institution performing research into alternative methods of sustainable agriculture.*
[19] *One way street*

5. Thermodynamics, a Drama of "*This World*", Essay no 3

5.1 Rules of the Game

Laws of nature

Laws of nature are nothing but man's interpretation of external stimuli. Of course experiments are arranged in such a way as to limit or reduce or control subjectivity, and mathematical tools of interpretation have been checked and counterchecked among peers resulting in a consistent analysis and interpretation of data. *Nevertheless these so called laws of nature are not laws of nature at all, they are laws made by man to the best of his ability, proven by practise in most cases to be true, reflecting his/her insight into the real world.*

If anybody believes on one hand that laws of nature represent a static worldview, they are in for a surprise, and if on the other hand anyone thinks that laws of nature can be adapted to reflect politics or vested interests they are not only in for an unpleasant surprise but will be repeating a mistake so often made not only by believers of extreme fractions of monolithic ideologies claiming the earth to be the centre of the universe, that life can adapt to political will or that man is free to choose her/her gender based on desire, but also by run of the mill politicians caught up in the act of societal engineering.

So laws of nature rest not only on our ability on one side to abide to an agreed set of rules or procedures once we have defined an injunction or a statement, and but also to refrain from interpreting the laws of nature to suit our own narcissism and power ambitions.

Laws of nature are a product of mans insight. With this I mean mans combined ability to observe and retract in order to contemplate over what he has observed, and as our insight evolves and we make new observations so does our insight and our ability to interpret what we observe. Hence the laws of nature are then amended accordingly. This evolution of laws of nature is perfectly possible within the bounds on the one side rationality, and on the other hand political narcissism.

Laws of nature evolve, are irreversible, and non negotiable. Irreversible, because once we have come to a higher level of insight we do not revert to an earlier one. Once we understand the theories of Einstein we do not revert back to Newton or Plato, and non negotiable because there is no owner of laws of nature with whom to negotiate, meaning laws of nature come from man, and if man wants to amend the laws of nature he is free to do so, providing he reasons with himself and with his peers and follows certain agreed upon procedures belonging to the realm of science.

Why Themodynamics?

Once we understand that laws of nature are not static, and evolve with our understanding and interpretation of reality, how does this apply to thermodynamics? What place do the laws of thermodynamics carry in our interpretation of reality, and why do we even dedicate a chapter to this law that doesn't even seem to concern people in their everyday lives? Who cares about thermodynamics if there is no beer in the refrigerator?

The laws of thermodynamics are not laws about machines; they are *laws about "This World"*. [20] They are cornerstones of the natural sciences and *define limitations which apply to our society and our way of life*. Thermodynamics is qualitative and not quantitative, and the limitations they imposes on a civilisation that builds its existence on energy are therefore existential in nature. This Essay is dedicated to that drama and the main authors of that drama. You my dear reader you are the main actor playing your role in the drama of "*This World*".

Thermodynamics, unlike Einstein's theory of relativity or Newton's law of gravity, was not discovered; it has evolved as a result of generations of thinkers, it has created a successive series of paradigms encompassing the natural sciences, the arts, literature and music.

5.2 Sadi Carnot, the "Killer of Illusions"

Sadi Carnot was the first author in the drama of thermodynamics, writing a script that even Einstein one century later would admit was so basic that it never would be changed; only improved upon. Carnot a young graduate engineer from the French army school of engineering, being the first on the scene, inadvertently created the foundations of a completely new branch of physics Thermodynamics.

The first act in the drama of classical thermodynamics is enacted in the beginning of the industrial revolution, and offers us two fundamental concepts.

First Law of Thermodynamics:[21] states that energy can be converted from one form to another, but it cannot be created or destroyed. The total amount of energy and matter in the Universe remains constant, merely changing from one form to another. The First Law of Thermodynamics (Conservation) states that energy is always conserved; it cannot be created or destroyed. In essence, energy can be converted from one form into another, but always at a price as we shall see in the second law of thermodynamics.

Second Law of Thermodynamics: states that "in all energy exchanges, if no energy enters or leaves the system, the exergy of the state will always be less than that of the initial state. Exergy is that energy that can be converted to work." The fraction which is lost is also commonly referred to as entropy. A watch spring-driven watch will run until the exergy in the spring is converted to entropy, and not again until energy is reapplied to the spring to rewind it, creating exergy manifested as the tension of the spring. A car that has run out of petrol will not run again until you walk to a petrol station and refuel the car. Once the exergy locked in carbohydrates in your body is converted into kinetic energy (energy in use for motion), it will

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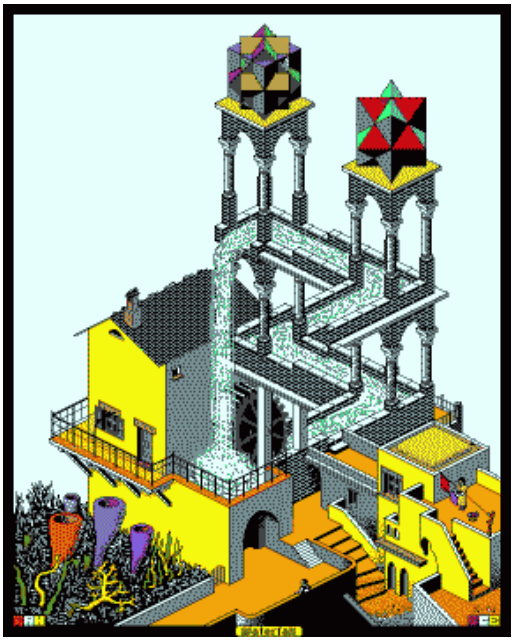
[20] *This deep insight was stated by Nobel Laureate in Physics Richard Feynman during one of his lectures at California Institute of Technology in April 1964*

[21] *Strangely Isaac Newton two hundred years earlier did not know of energy. He makes no mention of energy, only of mass, force, acceleration and momentum. All Newton's equations assume the conservation of momentum without any concept of the conservation of energy. Had he known the concept of energy, nothing would have prevented him from linking the concept of conservation of momentum with the concept of conservation of energy and matter, stealing part of Einstein's show, The Special Law of Relativity, 250 years earlier, but as Arthur Koestler, in his Sleepwalkers, A history of Man's Changing Vision of the Universe., (Hutchinson of London 1959) has pointed out, science emerged as Sleepwalkers dreamed themselves into the future.*

take you to the next petrol station. In the process of energy transfer, some energy will dissipate as heat. Entropy is a measure of disorder: cells in living creatures are NOT disordered and so have low entropy. The flow of energy maintains order and life. Entropy wins when organisms cease to take in energy and die.



Both of these laws came about during the industrial revolution. Robert Mayer is said to have formulated the first law of thermodynamics in 1842 and Sadi Carnot, is said to have formulated the "Second Law of Thermodynamics" in 1824, responding to a need in their time, *why do I not get more out of my machines and why can I not create perpetuum mobile*, building on earlier work about gases by Boyle and Gay Lussac.

The first and second laws of thermodynamics tell you something about the end state, meaning what the condition is when the work is done and game is over, but they tell you nothing about how fast or why you get to that end state.

The property of heat transfer was not properly understood, there was no proper insight into the physics of gases or of statistical mechanics. Maybe it was a stroke of luck, or maybe a stroke of genius, that three units, pressure P, volume V and temperature T, existing only as average values of something and the result of experiments were recognized. Assuming also that heat and temperature were proportional, allowed Sadi Carnot[22] to formulate his famous second law which can be interpreted as:

$\eta < 1-T_1/T_2$, meaning that the efficiency of anything, machine or living creature performing work, *can never ever be greater than* 1-the ratio of the temperature of expended heat from the machine versus applied heat to the machine. As said before this is a law about "*This World*" including machines, but not only about machines and it tells us something about what Man can expect in life. How much he needs to put into a machine to get something out of it; or how much energy he himself as a living being needs to put into something, in order to perform work.

A car engine provides an efficiency of about 25%, which means 75% of the energy in your petrol becomes heat and only 25% to propel you forward. So one would expect research to give us great efficiency improvements, were it not for the fact that this efficiency is built into the makings of the internal combustion engine itself; determined by the temperature of combustion as petrol ignites T_2 versus the temperature at the tailpipe T_1. There is no black magic or woo do here.

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[22] *By introducing averages, which was formally correct, although the statistical proof of the existemce of averages had not yet been proven, and avoiding statistical mechanics which formed the basis of quantum theory introduced 90 years later, Carnot, through genius or luck, could formulate his famous law out of more or less thin air.*

A nuclear power plant has an efficiency of 60-65%, leaving 35-40% of the energy as heat to be cooled off as waste. Also here there is no woo do, the input to the turbines driving an electric generator may have a temperature T_2 of 700 °C, while the output may have a temperature of 200 °C, giving us a theoretical maximum efficiency if there was no friction involved of 70% efficiency, and in practice 60-65%.

There is however a hidden side of the story carrying a message of paramount importance at the limit that the Carnot principle provides.

Any machine working at the ultimate efficiency defined by Carnot will become infinitely complex, and will hence be infinitely expensive to build, since it has to be friction free, and operate at an infinitely high temperature at the input.

This means that we are faced with material problems of" *This World*". Friction free means extremely low temperatures to cool superconductive magnet bearings, while extremely high temperatures at tens of thousands, maybe millions of degrees are needed at the engine input. So the engine must be cold and hot at the same time, it must withstand extremely high temperatures and remain infinitely reliable, reflecting the long payback time of such a complex machine.

Let me just state crisp and clear this machine is a dream and can never be built, or stated in other terms it will be infinitely expensive, taking resources from society and the environment that do not warrant it's existence. It will be a temple of self destruction. Then by definition the investment of exergy etc put into such a machine will always exceed the value of the work performed.

There is thus a cost side to Carnot, saying that you can get away with cheap reasonably efficient, say ή= 25%-50% machines in this world, which means that 1/2 to ¾ of the power is lost as heat. ***So, provided you waste energy,*** *taken from your running expenses****, you can get away with cheap machines.***

and

If you want more efficient machines, assuming these can be built, you will find yourself spending resources upfront, taking from the savings account, and as stated before ***then by definition the investment put into such a machine at the limit will inevitably exceed the value of the work performed.***

What I am saying needs to be spelt out even more clearly

THERE IS NO SUCH THING AS A HIGH EFFICIENCY POLLUTION FREE LOW ENERGY MASS CONSUMPTION SOCIETY!!!

High energy waste is a thus a built in paradigm of mass consumption and it is governed by the laws of Thermodynamics not by politics. There are no ways around it. Less energy waste will mean larger upfront investments, taking resources from other spheres, such as human endeavour or the environment.

The ramifications of this are enormous and let us not forget we are talking about reality not about technology or some kind of politically driven reality based on dogma.

- There are no super high efficiency fossil fuel, bio fuel, nuclear or fusion electrical Power Stations
- There are no emission free factories since exergy consumption will be infinite as emissions are pushed to zero. Zero emission means infinite energy.
- There are no emission free processes at all since the exergy consumption to achieve zero emissions will be infinite.
- There are no cheap and low cost ways of producing metal out of low grade ore
- There are no cheap and efficient engines or motorcars. There are inefficient small low cost engines of course.
- There are no clean sewage treatment plants that will not pollute, either by leakage from trapped pollutants or through the excess use of exergy to reduce pollutants to zero.
- There is no sustainable centralised fossil fuel based agriculture.[23]

Carnot's law is a typical limitation of our existence. Of course we can continue to deny that these limitations exist, and as long as we have plenty of low cost fuel, hi-grade metal ores etc we can continue running low efficiency processes in general. As soon as hi grade metal ores are depleted and the mining industry consumes large amount of exergy while cheap low cost oil is depleted as well, we will experience a compound effect and competition for the capital needed for mining versus oil exploration, food production, environmental services etc, and *then we have not even mentioned how the negative exergy balance will undermine life sustaining processes.* The second law of thermodynamics is non negotiable, and its existence forces us to make choices about life and our lifestyle.

The price of overextending our natural systems comes with an irreversible destruction of our environment and consequently, puts an end to sustainability. There is a further discussion about this issue in section 5.5 in this essay, Barriers to Complexity.

[23] Of the energy used to produce a loaf of bread at your local supermarket 5% is photosynthesis 95% is oil. For chicken etc it is even worse.

An Allegory of Time

Time became an essence to Man when she put the plough in the ground and started to organise life around agriculture and its attachment to the seasons. Time was so essential to Man that those in power, kings and priests, found it natural to take control over this"asset". By controlling"time" those in power controlled Man, and by its attachment to agriculture, Mans existence. In ancient Mesopotamia it was the priests who were the astronomers. In ancient Jerusalem the rites and rituals revolved around the moon, dictated from the high priests in the temple. Roman emperors defined their own calendars, and Julian and Augustus even changed the calendar to be remembered even to this day in July and August. With the advent of Christianity and St Augustine, time was wrenched from the cyclical to the linear, from an eternal cyclical procession of events to a linear concept of time ending in heaven or hell; in a theological framework steeped with dogma. Christianity, both in medieval times and after the reformation controlled the rites and rituals of life and death and therefore time and the arrival of the Messiah gave time a specific and eternal significance.

Isaac Newton, a deeply religious member of the Unitarian Church saw no conflict in his laws of nature and the Christian faith, to the contrary.

In his time the value spheres were not yet separated, the industrial revolution with its emphasis on time and discipline had not yet come about, Cook had not circumnavigated the globe and time remained well tucked under the pillow of the Church, an integrated part of its dogma. With the ascent of knowledge, science and human rights in the 18thC time took upon itself a special meaning. Greenwich outside London and the standards in Paris put the units of time, distance and mass into the hands of enlightenment, and with industrialisation and the advent of "*Modern Times*" time became part of Man down to the level of minutes and seconds as he became involved in a new synchronised reality. Time, together with Charles Darwin's undermining the story of creation, became part and parcel of modernity's onslaught on the church, and when the last vestige linking Isaac Newton to Christian dogma was eradicated, by Boltzmann, logic triumphed.

By introducing the atom, collisions and probability, and by defining the direction of time as a sequence of probabilistic events Boltzmann created his own and modern sciences distinct concept of time. Time moves forward as exergy is consumed, and backwards as exergy is created.

5.3 Ludwig Boltzmann, the "End of Regression"

Next we turn to the Austrian Physicist Ludwig Boltzmann, who in 1877 assumed that heat transfer was due to the collision of particles at the atomic or molecular level. Particles or atoms colliding with each other would transfer energy, thus heat, and in this way even out any differences in temperature. A return to the original starting point would be extremely improbable, because the atoms do not have a memory, just as the heat in a kettle never can return to the furnace.

Although there was no formal proof for this and no proof of the existence of atoms, he managed to establish the mathematical relationship between entropy and the statistical analysis of molecular motion, founding the branch of physics known as statistical mechanics. Boltzmann´s statistical interpretation led him to conclude that entropy -decreasing processes were exceedingly improbable but not absolutely impossible.In other words Boltzmann was the first person to prove what is obvious to us in our time, the fact that time moves forwards not backwards, in analogy with the watch spring used in the second law of thermodynamics. Time moves forward because we "observe" change, the arms of a clock, the ticking of a watch or the ageing of a person. Absolute time does not exist, as Einstein would prove 60 years or so later, only time created through events, in the case of Boltzmann the collision of atoms..

So as Boltzmann observed time moves forward as order is reduced through the progression of events. In statistical terms it is highly improbable that time moves backwards and then it can only do so in a limited part of the universe. Described in a another way, in an analogy to a story in 1001 Nights, that time will only move backwards if we get the Jinn back in the bottle again, and we can only achieve this according to Carnot if we dissipate energy, which according to Boltzmann means while time moves backwards in the bottle time will move forwards in another part of the universe where heat used to get the Jinn back in the bottle, is dissipated.

What is obvious to us was not obvious in the time of Boltzmann. It was an age of great optimism with a positive state of mind. Railways crisscrossed Europe; Otto invented the internal combustion engine in 1876 and Karl Benz the practical motorcar in 1885. The standard of living increased dramatically, so did national identity and colonialism. Nobody wanted to replace a story of boundless deterministic optimism with a story of statistics that ended in gloom and doom; but that was the story that Boltzmann had to offer. Science and technology were regarded as synonymous with progress, and progress with the advance of time.

(See figure below, depicting the Jules Verne's vision for 1978)

Yet ever since Isaac Newton, time had not been an issue it being well tucked under the church pillow of dogma.. Newton's equations are neutral to time. In fact in his equations time can go both forward and backwards, you can denote time with a +t or a –t it does not matter which of these you choose. The universe, according to Newton, just like a clock can in principle be made to move forwards or backwards. In the time of Newton, the universe was THE CLOCK of providence!

This imperfection in the laws of Newton, which assume a dynamic equilibrium, was nevertheless in perfect harmony with Christian faith and its dogmas. Progress was deterministically oriented, well in line both with St Augustine's[24] City of God and the theories of Isaac Newton.

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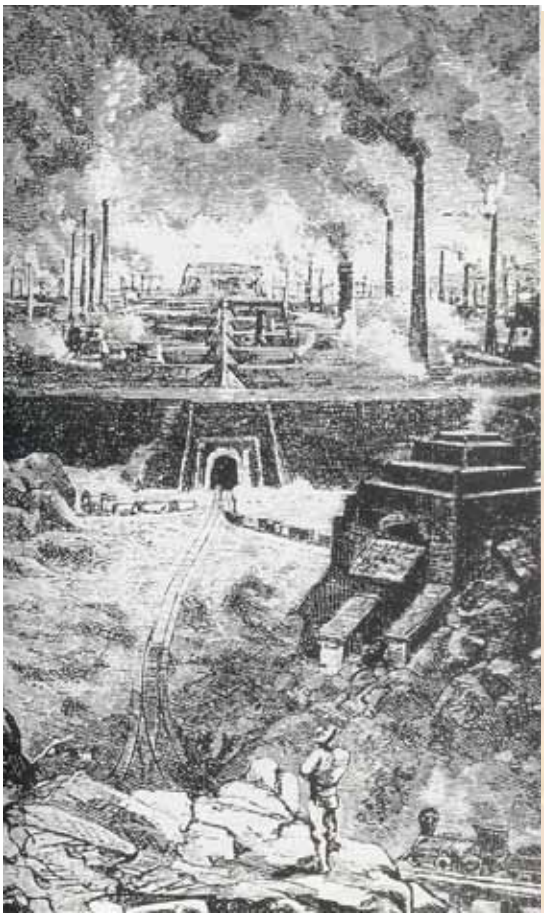
[24] *See essay no 5.*



Stahlstadt, or Cité de l´Acier, Jules Verne's
"*Les 500 Millions de la Begum*"
Vision of the year 1978, written 1878,

Depicts "*This World*" not so much different from our own

The separation of the value spheres introduced by modernity had not yet broken through in the general consciousness. A worldview based on Newton's ideas and Christianity were indeed so strong that Boltzmann and his more sophisticated, statistically and existentially oriented view was not to be understood, being on the threshold to the atomic age, his ideas were rejected by society and Boltzmann tragically killed himself.

His work being based on the hypothesis of the existence of atoms was not accepted by the majority of scientists in those days, and neither were his ideas about time, about the end of the

City of God and God playing dice with man, as Einstein later would put it[25]. Boltzmann became the corollary of Charles Darwin in Physics, in doing so; he cut the dogmas of the church to threads and confining them to their only area of competence, Spirituality.

With Boltzmann, thermodynamics had reached a new and more sophisticated level of symbolical awareness. Boltzmann was able to bridge the macroscopic/deterministic, the physical and tangible, and the microscopic/statistical, the abstract and theoretical, worlds of physics linking them via his famous constant *k*. In this way temperature T could now be defined, not as an empirical parameter, but the result of a statistical process and Carnot as an empirical law now became fully justified by Boltzmann´s introduction of statistical thermodynamics. (See figure below from Journal für die Reine Angewandte Matematik)

Just as Einstein 50 years later changed the world of science with his theories of relativity; Boltzmann changed our perception of reality by introducing statistical mechanics leading to a new concept of time. He ushered us into the atomic age, a new age of structured uncertainty. He opened the door to Schrödinger who gave us statistical quantum mechanics, to Heisenberg who quantified uncertainty, to Bohr, Wheeler and Rutherford who gave us the inner workings of the atom and Shannon who gave us the statistical theory of communication. Boltzmann must be credited for not only providing proof for Boyles general theory of ideal gases but also for linking up Shannon and Carnot under the same general theory.

The impact of Boltzmann cannot be overestimated; he undermined dogma and invited us to participate in a new and fragmented reality. His ideas resonated in politics (nihilism), the arts (cubism) in music (Schonberg and Berg) and in literature (existentialism). Boltzmann heralded the end of one era and the beginning of another. He gave modernity a new face, without him we would neither have had the atomic age nor computers. Just as Carnot before him Boltzmann left us with a legacy of new unresolved challenges, tasks not yet tackled by a church on the retreat, whose ideological foundations he so effectively had cut to shreds.

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[25] *Neither Einstein could completely accept a world without a benevolent creator*

$$T = N \cdot \frac{\int\int \cdots \frac{(E-V)^{\frac{h}{2}}}{\sqrt{\mu_1 \mu_2 \cdots \mu_h}} dp_1 dp_2 \cdots dp_h}{\int\int \cdots \frac{(E-V)^{\frac{h}{2}-1}}{\sqrt{\mu_1 \mu_2 \cdots \mu_h}} dp_1 dp_2 \cdots dp_h},$$

so kann man auch schreiben

$$\frac{\delta Q}{T} = \frac{2}{h} \delta \log \text{nat} \int\int \cdots \frac{(E-V)^{\frac{h}{2}}}{\sqrt{\mu_1 \mu_2 \cdots \mu_h}} dp_1 dp_2 \cdots dp_h,$$

womit die zu beweisende Formel in ihrer vollen Allgemeinheit erwiesen ist. Bewegt sich eines der Systeme während der sehr langen Zeit t, und ist dt derjenige Bruchtheil der Zeit t, während dessen die Coordinaten zwischen den Grenzen (1.) liegen, so ist

$$dt = t \cdot \frac{\frac{(E-V)^{\frac{h}{2}-1}}{\sqrt{\mu_1 \mu_2 \cdots \mu_h}} dp_1 dp_2 \cdots dp_h}{\int\int \cdots \frac{(E-V)^{\frac{h}{2}-1}}{\sqrt{\mu_1 \mu_2 \cdots \mu_h}} dp_1 dp_2 \cdots dp_h}.$$

Hängt also alles von einer einzigen Variabeln p ab, welche nach einer endlichen Zeit t (der Schwingungsdauer) wieder denselben Werth annimmt, so wird

$$t = \int \frac{dp}{2\sqrt{\mu}\sqrt{E-V}}, \quad \delta Q = 2T\delta \log \text{nat}(T.t).$$

Zur Versinnlichung können zwei in den langsam veränderlichen Distanzen r und ϱ von zwei fixen Centren mit den ebenfalls langsam veränderlichen Winkelgeschwindigkeiten w und ω sich im Kreise bewegende Massen m und μ dienen. Hier ist $r = s_1$, $\varrho = s_2$, $w = p_1'$, $\omega = p_2'$. Es müssen N Punktepaare vorhanden sein, in denen alle möglichen Werthepaare von w und ω vertreten sind, für welche

$$\frac{mr^2w^2}{2} + \frac{\mu\varrho^2\omega^2}{2}$$

den geforderten Werth E der Gesammtenergie hat. Natürlich ist jedoch in diesem Beispiele die Bedingung nicht erfüllt, dass die Eigenschaften jedes einzelnen Punktepaars von den Anfangsbedingungen desselben unabhängig sind, weshalb der bewiesene Satz hier bloss für die auf alle Punktepaare bezüglichen Mittelwerthe, nicht für die auf ein einziges Punktepaar bezüglichen Werthe gilt.

Graz, September 1885.

Ludwig Boltzmann´s formal deduction of Carnots Theorem
Using Statistical Mechanics September 1885
Journal für die Reine Angewandte Matematik

5.4 Ilya Prigogine"Chaos, the Mother of Creation"

From Being to Becoming

The next hero in the drama of thermodynamics is Ilya Prigogine, a Russian immigrant to Belgium who received the Nobel Prize in 1977 for chemistry. Prigogine took mankind's insight into thermodynamics one step beyond Boltzmann. Many contest his theories, the ramifications of his thinking, however, cannot be done away with.

While Newton's and Boltzmann´s models are based on linear theory, meaning that we only have to deal with collision between particles who are not changed other than in speed and direction, Prigogine not only assumes collisions but also that the particles can react with each other as they collide, forming new substances and other, new forms of order. We call this a non linear model of thermodynamics because change can be sudden, unpredictable and take many directions. While Boltzmann leaves us with a reasonably predictable story, Prigogine tells us that life is unpredictable meaning that unexpected things can happen; a dilemma so well exemplified in the film Jurassic Park where Entrepreneur John Hammonds static and controllable vision is put against Mathematician Dr. Ian Malcolm's vision that life always finds new unpredictable ways, as indeed it did in the films violent and unpredictable ending.

While Newton said nothing about the future and Boltzmann did via statistics lead civilization to gloom and doom, Prigogine gave mankind a new vision. He could in fact prove that if energy was added to a system, atoms or molecules could, under certain circumstances, react with each other and form new structures binding exergy. Such events called bifurcations can be triggered in a number of ways resulting in structures of greater complexity and higher informational content.

An example; as energy is added to a gas or a liquid, there is a finite possibility that a substance is formed that happens to be its own catalyst stimulating its own growth[26]. Under such circumstances the growth of this new substance will be immediate expanding spontaneously, originating from a self organised freak event. The autocatalytic process is the means through which the structural information created by the freak event is communicated through the unstructured gas or liquid, creating structure in it, raising the level of complexity in that medium. The structures created thus can be described using something the mathematicians call differential equations. These are equations that describe how a *change* (*differential*) can have a major impact on a process. It can be shown that even the most simple so called differential equations describing a non-linear process can result in a multitude of beautiful and different structures, such as the shape of a seashell generated through its growth, the evolution of an ice-crystal or the wave patterns created by the wind in the sand. In fact many natural phenomena are caused by very simple feedback mechanisms and can be triggered spontaneously. Much of that which we perceive as structured beauty in nature, and have learnt to associate as beautiful; originated in chaos and can be mathematically described by differential equations.

So while Newton promised order for ever and Boltzmann promised disorder out of order, Prigogine said that order, in fact new order could be created out of disorder under certain circumstances. Using Boltzmann´s argumentation, time would then move backwards as well as forwards. So much is to be said about the dogmas of Christianity or any other fixed idea

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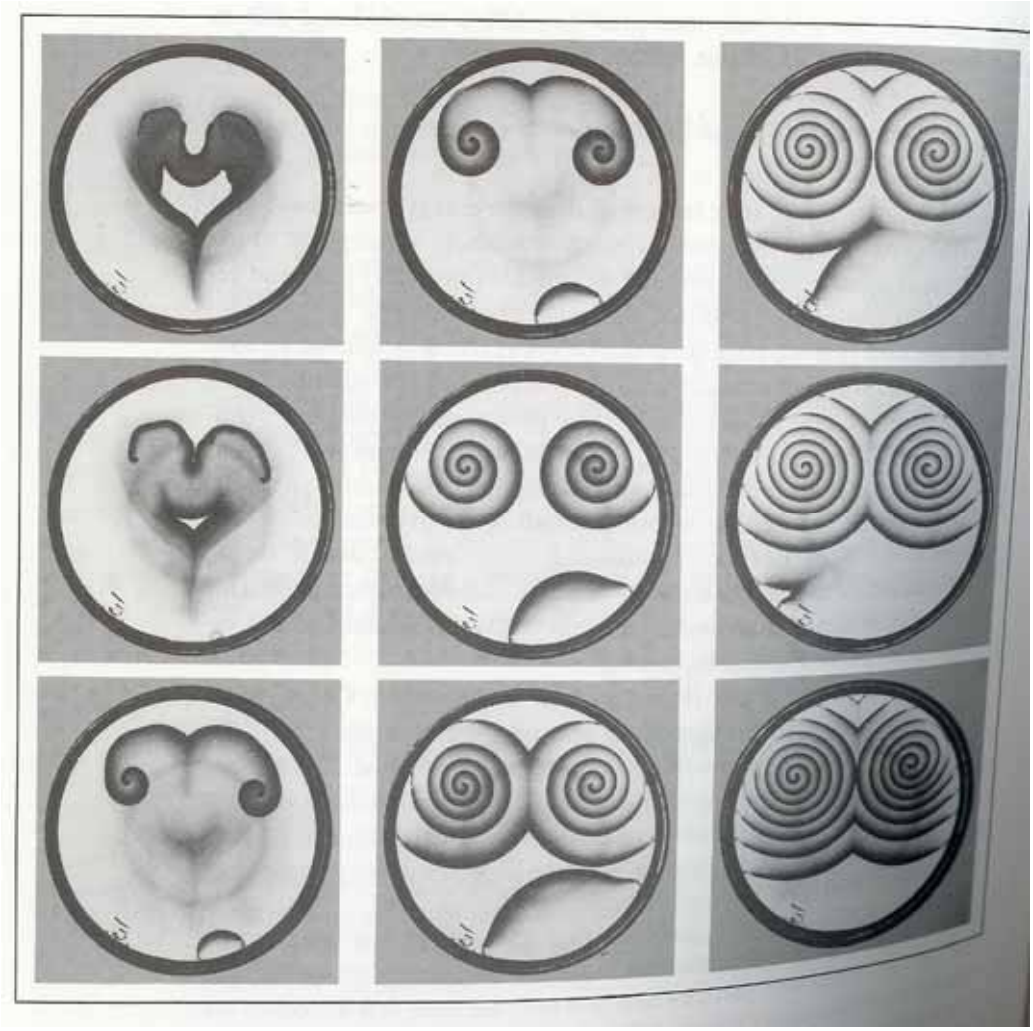
[26] *of course providing there are substances and energy to feed the process*

about time, and something can also be said about Taoism and the eternal flow of creation and re-creation which we will discuss more in a later chapter comparing religions. It may already seem apparent to the reader that it is perfectly possible that science, art and religion can co-exist as three different but equally valid ways, or views of "*This World*".



Chemical Scroll Waves
Ilya Prigogine, "From Being to Becoming"

Prigogine´s findings are significant, because they tell us that the future cannot always be predicted. Sudden and immediate changes can take place in our environment, in our ecosystem and in the biosphere, radically changing the conditions of life if we deviate strongly from what is perceived as equilibrium. Such visions are already apparent in the ongoing discussion about climate change, sudden melting of the polar caps, sudden and violent political reactions to seemingly small freak events (differentials) etc.

Newton got us used to the fact that nothing changes, we have reached the end of time, and he represents the Messianic vision.

Boltzmann taught us that death is inevitable and time only moves forward, he represents irreversibility, gloom and doom, or enjoy life while you can because that's all there is.

Prigogine warns us of a possible unpredictable future. He teaches us that although we can understand thermodynamics, we cannot always use it to predict the ramifications of our doings if we stretch things too far. He represents the apocalyptic vision.

5.5 Fundamental Barriers to Complexity, or the "Gates to Eternity"

Returning now to the societal implications of Carnot, we now find the same problem wherever we look at thermodynamics. The corollary to the instability found in Prigogine is the complexity barrier found in Carnot, Shannon and Einstein. There is an ultimate barrier of cost or chaos, ***a kind of door through which Man cannot not pass***.

Reminding us of the fact that only an infinitely complex machine can get anywhere near the limits put forward by Carnot ή< 1-T1/T2;

We find the same rule about Shannon C/B=2log (1+S/N).
C is channel capacity, B is Bandwidth, S is signal and N is noise.
Only an infinitely complex radio receiver, with an infinitely complex information decoder, consuming an infinite amount of power, and taking an infinite amount of time to decode the information, will ever be able to decode information at the rate-threshold set by Shannon, which by the way is Boltzmann applied to Carnot in the sphere of information.

So what about Einstein? Well he has stated that the maximum amount of energy E that can ever be extracted from an amount of mass m can never be greater than the mass times the speed of light squared, hence $E=mc^2$, and the hidden message here again is that this can only occur at infinite system complexity, for example a fusion reactor that will only remain stable for a second or so anyhow, or the only place where fusion occurs at a regular basis is in the stars, reminding us that the ultimate source of our existence is cosmos.

"Hot fusion is tough because the fuel—a kind of hydrogen—has to be heated to a hundred million degrees Celsius or so before the atoms start fusing. At those temperatures the hydrogen forms a roiling, unruly vapour of electrically charged particles, called plasma. "Plasma is the most common state of matter in the universe," says one physicist, "but it's also the most chaotic and the least easily controlled." Creating and containing plasma is so challenging that no fusion experiment has yet returned more than 65 percent of the energy it took to start the reaction."

National Geographic August 2005

Now imagine a society stretched to extremes, wanting to extract as much fossil fuel out of the ground, as much minerals as possible out of the crust of the earth, have as many machines as possible running at the highest possible efficiency, and extract as much energy as is possible out of matter using fusion to keep all the processes going, while allowing mankind to grow exponentially as well as his consumption.

Thermodynamics tells us that this can only be done at an ever increasing cost, requiring more investment to build the structures necessary than they ever will be able to deliver in the form of useable goods and services. The net result will be taking resources from other and more urgent areas such as agriculture, healthcare, education and the environment; resources that

will be lost forever since they will be taken from life sustaining systems. Our civilisation will consume its own children.

The price, due to complexity, to be extracted at the end of modernity after one and a half centuries of exponential growth is many many times the price to be paid in the beginning. While industrialisation in the beginning did not extract a high cost, as time progresses the consumption of exergy and cost increase; and as we get closer to the fundamental barriers of thermodynamics, the cost goes theoretically to infinity.
The true understanding of the complexity barriers is that of an invisible chasm that can only be avoided if we bring together the worlds of the HOW with the WHY, the worlds of physical reality and spirituality in a common quest for truth.

5.6 So……

So our insight into thermodynamics reflects our view on life and on society and has evolved with it as we have moved from one paradigm to another. Insight into thermodynamics cannot be viewed in isolation. Since insight into thermodynamics represents a moving target it will be very difficult to create consensus around a common world view. Anyone who does not include Prigogine will come to radically different conclusions compared to someone who does, and lets face it there are those that still do not comprehend the ramifications of Boltzmann even today.

Those who understand Prigogine will realize that information contained in structures play a decisive role in their transformation. Once information exchange takes place at the micro level in seemingly stable circumstances, change will be sudden and omnipresent[27]. We cannot plan for this event, only try to avoid it by being prudent, respecting the biosphere and our ecology for the fragile dynamic and nonlinear process it is.

A self organising structure, yes indeed life itself automatically implies spontaneous formation of information as a part of the creation of new structures i.e. Exergy. In this way Exergy can be regarded as the fruit of creation, but before even Prigogine, psychoanalysis and art were touching upon concepts and thoughts that were in the air, that had not yet been formulated by science. Other parts of the value spheres, interrelated, with their own inner logic and mode of being reacting to the dysfunctional state of "*This World*".

"*The search for what is meaningful and true by opposition to noise is a tentative step that appears to be intrinsically related to the coming into consciousness of man facing a nature of which he is a part and which it leaves.*"

Ilya Prigogine, Autobiography Died May 2003

"In all Chaos there is a Cosmos in all order a secret order"

Carl Jung (1875-1961), Swiss psychiatrist. Collected Works, vol. 9, "Archetypes of the Collective Unconscious

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[27] *Will happen everywhere*

Wassily Kandinsky, Chaos
Born 1866, Died. 1944

Each period of a civilisation creates an art that is specific in it and which we will never see reborn. To try and revive the principles of art of past centuries can lead only to the production of stillborn works."
Quote W.K.

Wassily Kandinsky is widely considered the first true "abstract" artist. For Kandinsky, *the randomness and seeming incoherence of shapes and smeared colours held a deeply spiritual significance, a symbolism of the inherent chaos and disorder governing the universe.* While the staunchly abstract works of Kandinsky's career may seem fragmented and irregular to critics, a closer examination reveals strong thematic elements in each piece: the struggle between nature and culture, the loss of personal identity in the public mob, the subversion of individuality in the name of ordered authority. Text art publishing.

6. The inner workings of a New Paradigm, Essay no 4

The New Apollo Project, putting Man's feet on Earth

Understanding thermodynamics will not be sufficient in defining a way forward. We must also comprehend the ramifications of thermodynamics in society, the price of complexity, and how it will have an impact on the decisions we make. How it is part of a whole system and how we need to apply a systemic view to understand cause and effect and better formulate questions to be tackled in the sphere of spirituality. In other words we must understand the inner workings of how man and society will interact with "*This World*".

The world population is still growing at an alarming rate, and so is their destruction of information bearing structures. The consumption of fossil fuels is expected to increase threefold within the next two decades. Western ideology and western patterns of consumption have been adopted by the largest centres of population, China and India. Exponential growth, in combination with information delays[28] and slow decision-making will lead to an overshoot, and if that moves beyond it's elastic limits, a collapse of civilization as we know it today will be the result. Meadows and Randers, in their book Limits to Growth, have estimated that this may come about within the next 50 years or so. According to Meadows and Randers, we have to start acting now.

So what are our options?
Is new technology an option?
Well, the laws of thermodynamics tell us that this is not the case. Technology cannot surpass the limits imposed upon us by the laws of thermodynamics, and as we increase complexity, so do the cost of its implementation, and conversely the cost of its maintenance.

Is a sudden shift in our values an option?
Well no, these evolve very slowly with time, and sudden changes as we have seen in the 20th C in totalitarian regimes trying to force together the value spheres do not give us much hope that eco extremists and the anti-globalisation mob will ever act much differently than the Nazis and the Communists when given the opportunity to gain power. Extremists are by definition extremists and will never encompass a view broad enough to tolerate other and conflicting opinions, let alone the separated value spheres of reasoning, art and spirituality. That is part of their emotional makeup.

Well as very often part of the solution is found very close to the problem but in a different context. We must start with reducing our consumption, reducing the waste we encounter everyday in all our systems, in the way we produce and distribute goods, in the way we produce services, in the things we choose to do and not to do. We must show compassion with our fellow creatures on this planet, man and beast, and re-establish a meaning with our lives. Above all we must not lose hope and become an easy pray to apocalyptic preachers; neither must we be fooled by, or tolerate naïve technocrats who tell us that it is all just a matter of technology.

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[28] *According to Meadows and Randers exponential growth and delays are the two foremost mechanisms in creating overshoot, a condition where demand outstrips supply over a longer period, leading to collapse of either the supply, financial, or ecosystem and the human population, if overshoot is not brought under control.*

So yes, I believe there is hope. I believe in a total re-engineering of society, based not on consumption or new technology, but on the core values of western civilization, based on a covenant uniting reason and spirituality.
The cynic about western civilization will laugh; reminding one of the white mans burden, colonialism, slavery etc
Yet I am still convinced that this is the right way to go, not because it is the only option, but because it is the only sensible way that could work if we really tried. It is close at hand, and allows us to migrate from where we are today, both using the eye of the mind and the eye of the spirit
That does not mean that we do not have to re-evaluate how we do things, and perhaps even more important why we do things, using two thousand years of civilisation as a starting point.

1. Firstly we have to start with the ecosystem, and respect the way it works, the way information is exchanged at the molecular basis at all niches in the eco system. We must understand that many new and synthetic substances do not have a molecular structure that can be recognized by the ecosystem for the simple reason that the informational structures do not match, in other words they do not speak the same language. It is first when one substance recognizes the other at the molecular level that they can interact and one of them can be broken down. So in plain English, nature cannot dispose of the rubbish if it does not recognize the stuff. And even if the substances we produce are compatible with the ecosystem, we must be careful not to overload the ecosystem. For example organic refuse consumes too much oxygen in the water which suffocates plants and fish, and in this way changing the environment irreversibly.
2. Secondly we cannot expect the ecosystem to absorb any amount of waste. Our present paradigm is a high energy society; in fact the whole urban-western way of life reflects high energy density. If the ecosystem were to absorb and breakdown all the substances we produce, assuming they were compatible, we would have little land left for other use, and certainly no pristine areas left for study and recreation.
3. So we are not talking about technology, we are talking about changing the way things are done; what we expect from life, what we prioritize to do and not to do. Whether we own or share things. Whether we produce our food locally or far away. We are talking about changing the rules of the game. We must define new policies[29] and the way policies are introduced in the way we do things. Policy is not reflected in technology, but it is reflected in organisation and architecture[30], if by architecture we mean the way a certain resource is distributed and made available as well as the structure to support it. This is not a fluffy concept, there are fundamental system principles based on science that can be used to define architectures giving us a greater degree of sustainability..

At this level of abstraction, we must ask ourselves if there are any basic rules that need to be adhered to, are there any architectural principles that we can apply. Well there are a number of principles, but before we discuss these we need to look at a number of successful cases where rules have been built into the way of doing things. It is interesting to note that both of these cases are phenomena that centrally controlled nation-states regard as being problematic

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[29] *Policy is a set of rules that are enforced in one or more processes*
[30] *Policy is reflected in the enablers. For example the traffic lights lighting sequence in a traffic system can reflect policy as well as the traffic signs defining one way streets. The streets and roads, and the paint on the roads as well as the traffic signals as such are technology.*

to their worldview being ingrained in the notion of centralised control under the auspices of the nation-state bureaucracy.

The Internet

One is the internet. In the classical phone network if you make a call from A to B, then you receive a dedicated resource transmitting information from A to B and vice versa, a resource which is yours and only yours, and that is what you pay for, even if you do not talk you still own that resource. If there are not enough resources to go around, then you will get a blocked tone. In most phone systems you will have a 0,5 % chance of getting a blocked tone at the busy hour. This is a very high level of availability and actually means that the phone network is heavily over dimensioned and most of the time under utilised, and still only provides one service[31].

In the case of the internet you share resources between A and B, and any congestion appears as short delays that mostly go unnoticed as packets travel from A to B. In this case we get efficiency improvements in the utilisation of the physical infrastructure by using a resource sharing protocol, called TCPIP. The TCPIP protocol is in this architecture the bearer of policy, and the way it is structured, it is intended to give all users a fair share of the network at any moment in time. There is a valuable conclusion that can be drawn from this: A physical resource is as effective as its ability to be shared, meaning the built in efficiency of the resource allocation algorithm[32].

Don't forget the sharing of resources, human and technical alike moves us farther away from fundamental barriers, reduces the attrition of resources, moves us from the level of machines to the level of me and you, the we and the us.

Quality

Another example is Deming's [33] method for quality management, developing and maintaining order in the organisation by, akin to Prigogine, reducing fluctuations and uncertainty, stimulating self organising processes. In Deming's world loss of quality is seen as waste. Excess deviation from certain specifications, for example a machined product that needs to be reworked will create loss if it is rejected, and will create delays in the delivery system if it is reworked. Loss of quality creates uncontrolled delay or waste.

Waste either creates bottlenecks and delays in the delivery system or requires an over dimensioned delivery system to cope with fluctuations[34] in the flow. If there are many uncontrolled delays along the production path of a widget[35], without information being passed on to the material source upstream of that widget, then raw widgets will be piling up at the source since these cannot be swallowed by the production line. The rules here are short information delays to control the flows between sequential processes steps and widen any bottlenecks that tend to appear. This must be achieved by clearly defining the responsibility of leadership and process improvement by continuous improvement. Goals must be set at all

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[31] *This is typical for dedicated, non shared resources. You can see this phenomena on most of our resources, roads, power network, phone services, suburban trains etc*

[32] *Algorithm is a way to describe a decision making process with the aid of mathematics*

[33] *www.deming.org Participation in the W. Edwards Deming Institute® means that we share Dr. Deming's vision of a better world. We participate because we strive, with joy, to carry on the work that he began. We seek to conduct ourselves in a manner consistent with his high moral and ethical standards, professional and personal integrity, and commitment to lifelong learning. We do this solely from our dedication to the philosophy and values of Dr. Deming and our belief that together, with humility, we can and will make a difference in the quality of life for everyone. "*

[34] *Fluctuations are variations. For example large flucutuatuins of traffic flow in a motorway will lead ti congestion, bottlenecks, delays, pollution, and under utilisation of the investment.*

[35] *Widget is the colloquial name for a "thing"*

levels and groups of people should cooperate on a learning process of continuous improvement. This method has been very successful in reducing waste in industrial processes and I do not see any reason why it cannot be used in many other processes in society.

A number of architectural principles can be applied to shared delivery systems.

1. Shared resources must contain software algorithms[36] to facilitate sharing. Only dedicated resources (the car waiting for you in the garage) will not need sharing algorithms. In the internet TCPIP is based on a sharing algorithm. A resource is never more effective than its allocation algorithm permits.
2. Participation in a shared resource system means accepting controlled delays as part of the resource allocation scheme.
3. A short delay path of communication between the user and supplier of a resource is important in order not to create unnecessary overshoot and hence waste. If the source continues to produce goods or services and is not aware of a slack in the demand end, we get overshoot. Overshoot can results in overextending resources and delivery systems creating congestion due to bottlenecks, which result in a further loss of efficiency and eventually maybe collapse of the entire system.

In theory these rules could apply to many types of delivery systems and all delivery and production systems should be analyzed and reworked to satisfy overall system and policy criteria.
As energy becomes more and more expensive we need to decide who the stakeholders are, even the silent ones such as the ecosystem, in determining our processes the policies to govern them, and find ways and means of including these stakeholders in our process re-engineering and the ways we enforce policies in the processes.

This essay is not a research project, its only intent is to point at some of the methods to exemplify a way of thinking that we can use when starting to re-engineer our processes.

1. What about food production, is large scale agriculture really that effective?
2. Are we weighing in all the costs incurred?
3. What would happen if the cost of oil increased say 20 times?
4. Would we still produce food in the same way?
5. What can be produced locally, what not?
6. Would we care more about the ecosystem if much of our food came from our own back yard and the waters around us?
7. What happened if 10-20% of the population in the western world worked in agriculture, instead of 2% today?
8. Why do we still build our sewer systems in the same way?
9. Why are we wasting all the nutrients that could be recycled back in the food chain?
10. Why are we polluting these resources with poisons, heavy metals, pharmaceutical products and hormones?
11. The simple reason for all this is that we have adopted our whole economy, our processes and everything we do, even down to the DNA of plants and animals to the oil economy.

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[36] *Algorithm is a way to describe a decision making process with the aid of mathematics.*

12. Oil is even cheaper than our own effluents. What would the price of oil need to change all this?

The challenge that faces us is a radical re-thinking, a re-engineering, based on other principles than the availability of cheap energy and the concept of affluence as we know it today. Paradoxically today we are creating unemployment, while many persons have no work or meaning and no intent in life, and we are consuming more and more resources while these are becoming increasingly scarce, requiring ever more energy to produce, undermining the stability of the ecosystem. To go further into a highly automated and more complex society, of affluence only for few and poverty and unemployment for the many will most certainly push society either into collapse or instability or both. The laws of nature are such that this is a non negotiable proposition. Sudden uncontrollable changes such as the impact of climate change may prove to be, or the spread of viral pandemics in our gene modified food production system, are only some of the signs of "chaos" awaiting us in a world stretched to the limits of its capability.

Finally I envisage a number of major research projects encompassing philosophy, technology, art and religion, encompassing the three value spheres to tackle our future. It is clear that our political system itself as we know it today will not be able to initiate or relate to such a change process, neither will it be possible to communicate such a lateral vision through the political system.
An environment privately sponsored and independent of political trappings and paraphernalia, and free from historical ballast, where such research can take place. Since the United Nations acts as an extension of the member Nation States it would be problematic to place such an institution under their auspices.
I propose the name "Aniara", named after the Swedish Poet and Nobel Laureate Harry Martinson as the name of such a project.
These are just a few questions. A challenge for many young well educated persons who could start working on this and many others issues and create a vision for themselves and their children. Humanity is not doomed to failure it is our present paradigm that has failed. We must have the courage to admit that and start thinking and educating in new ways.

7. Children of a Creating God, Essay no 5

While the earlier essays were dedicated to issues of science and historical evolution, this final essay will cover issues of responsibility and morality.
How do we approach this?
Is the environmental problem an inherent issue of responsibility for mankind as a whole?
Is it only an issue inherent in western civilisation?
Or is it only an issue that concerns me as an individual, as a member, as part of a larger community?

Who are we really? What are the mechanisms that have triggered this outburst of creativity, which in its turn has brought western civilisation to the brink of overextending the capabilities of its life support systems? Are they inherent in all mankind; are they a by-product of our specific civilisation? How was it possible in the first place to separate the realms of the real world with the soul? Is there anything in our religious heritage in our basic setup that allowed the mind to colonize the soul opening us to a world of self indulgence?

Who planted the seed of creativity in the first place allowing the fruits of this plant to spread their seed over the whole world? Who ever gave us this God forsaken right in the first place to manipulate the blueprint of creation, hence life itself?
Have we forgotten our task as Custodian of Gods Creation and unknowingly changed the "intent" of our destiny en route to the Promised Land?

Do I now know who the others are and WHO I AM?

7.1 Hinduism, Confucianism, Taoism, Buddhism and the Judaeo-Christian Concept

Unlike the Judaeo-Christian view of the world, the Hindus from 1500 BC do not imagine or even know of a benevolent creator. Instead they are awed by what they perceive to be the work of Divas, derived from the Sanskrit word Div meaning brightness[37]. The riddle of creation, how the world came about, and how it would end was irrelevant compared to the brightness, the awe, of the living world. The fire God Anji was everywhere, light gave man seeing, in Hindu Dharsan. Hindus believe in *seeing*, *in Dharsan*, in the inter exchange of energy between man and the deity. To see the Dharsan of a deity, a priest, a holy man, a place, a flower is a holy act.
Hindus will do pilgrimage to a place to take Dharsan, the seeing.
Dharsan is a *two way* flow of seeing, while the Hindu takes Dharsan, the Deity will give Dharsan. This two way flow between a person and deity is at the core of Hinduism, much in line with the spirituality and mysticism in other religions.
While the Hindu perceives a two way flow between him or herself and the deity, where SEEING is at the core of the Hindus perception, the religions of the western world, Judaism, Christianity and Islam found their way through the WORD.
"In the beginning was the word, and the word was with God and the word was God".
Western religions begin with the concept of ONE, a single unique God, a chosen people, a nation under God etc.

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[37] *In some way reminding us of Pauls perception of Jesus as light. It also reminds us of Matrin Bubers concept of the I-Thou relationship.*

This view is not shared by the Hindu. For them a single unified God could never have created such a complex and bountiful world full of beauty. Their perception of deity was fragmented, rather than unified. Dharsan could not be attributed to one single relationship, to one single God only. For them there are many Gods, a complex ever changing notion of deity, and inter exchange not leaving much scope for dogma.
For the Hindus the world was not created or brought into being. For them creation came about by the *disintegration* of oneness of unity into a multiplicity of *imperfect fragments*[38], ever undergoing change, a transformation of everything into a multiplicity of imperfect cycles of life and death the transmigration of the soul from one life to another, a soul, being a fragment of the whole striving for perfection[39], similar to the Cabbalistic concept of Tikkun Olam. Mans task being to put the pieces together to save the world, mankind and thus salvation for himself, is based on the story told about God having shattered a vessel during creation leaving it to mankind to fulfil its destiny by making creation whole again.

For Jews and Christians as well as Muslims, following their classic tradition it is just the other way around. A single creator God brings the world into being from nothing. "*In the beginning God created the heavens and the earth; the earth was without form and void*" Genesis 1:1

Even the Chinese philosopher Confucius did not see it our way. Just as was the case for the Hindus, the issue of creation and destiny was irrelevant. The saying, *"While you are not able to serve men, how can you serve spirits [of the dead]?...While you do not know life, how can you know about death?"* is attributed to Confucius. For him life was a practical matter and heaven if there was any, was attributed to morals and the accumulated wisdom of generations. His advice to Man had nothing to do with deity. "*A man who has committed a mistake and doesn't correct it, is committing another mistake*"; an advice probably applicable even to this day.
Confucius practical rationality did not altogether satisfy the mystical and existential needs of many; this brought Taoism into being, a more flexible and poetic complement to the more rigid Confucian state religion.

Taoism, or *the way*, introduced by Lao Tzu, born at the age of 900 had more to do with the unity of experience, oneness, the integrated experience of being, than the unity of one God and its creation, a unity composing of the flow and dance of natural forces the Yin and the Yang, at work shaping the world every day, integrating rationality and spirituality. Creation was at work everywhere in eternal harmony with no beginning or end; a vision similar to the one presented by modern physics. Worlds of dancing energy in eternal inter dependence. The more we study, and the deeper man digs into the mystery of physics the more we discover an eternal flow of dancing energy. Maybe telling us that man, using the artefacts of science with infinite complexity[40] ,is reaching the limits of his capability to conquer and master the universe.
Taoism spread to Japan, Korea and Vietnam, and some countries today even use the symbol of Yin and Yang as a national identity.
Unlike the view in the western world man was not at war with nature, but was part of it, part of the eternal cycle of events, ongoing creation, re-creation and quest for harmony, the balance of rationality and spirituality, the Yin and the Yang. The view of the east is apparent in many ways. Traditional Japanese houses and temples are not stone monuments lasting

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[38] *Reminding us of the notion of the Big Bang*
[39] *Similar to the notions nurtured by the Kabbalists, Rabbi Luria and the US writer and Philosopher Benjamin Franklin.*
[40] *huge accelerators dicovering a never ending series of short lived manifestations of energy in eternal inter exchange with each other.*

forever as we have become accustomed to in the west, but wooden structures, buildings that only last for 20 to 50 years. After that the wood is replenished. Man and his edifices are part of the eternal cycle and re-cycle, creation and re-creation.
In damp weather wooden houses swell and keep out the wind, but when it is hot and dry, wood shrinks and lets in the wind. A Japanese house is not only a shelter from nature, but also a man made structure that is part of nature itself. Bonsai bring nature into the garden and into the house itself, making man and his artefacts a part if the eternal flow of creation.

Like the other eastern religions, neither had Buddha an answer to the riddle of creation, but rather strove to escape the suffering of this world. Buddha's whole concern was salvation, to escape this world and make life irrelevant. Prince Siddhartha, later to become the Gauthama Buddha, was born close to Nepal in 561 BC. He was not unique, neither the first or would he be the last. He was only one in a long succession of enlightened ones reincarnated through the eons of time, the transmigration of the soul to finally reach enlightenment, nirvana and relieve him of the suffering that comes with all existence.

7.2 The Greek and the Judaeo Christian Concept

The Homeric scriptures of the Greeks, the Iliad and the Odyssey have nothing to say about the beginning of time. Instead it is a story told of human adventure, a story about man and Gods in the image of man, inspired by the Mesopotamian sagas of Gilgamesh of Gods in the image of man displaying all mans weaknesses. In contrast to other remnants of Greek culture, dramas, sculpture and architecture of which not much remains, the Iliad and the Odyssey has remained intact, memorised from generation to generation, much as Jews and Christians would memorise the Bible, and Muslims the Koran. The Iliad and the Odyssey were an oral creation that took form centuries before the Greek alphabet, the Alpha and the Beta an extension of the Aramaic and Hebrew, Aleph and Beth were introduced. In it we see man and the Gods in the image of man, fully matured embodying all the weakness of the human spirit. Only recently has it become obvious how much Greece owes to Mesopotamia for their literature and from Egypt for their art. How the Egyptian concept of eternal life left its indelible mark on art and architecture, while Mesopotamian, suffering from regular environmental disasters did not see eternity the Egyptian way, focussing more on the dilemmas of man's existence.
Homers creation avoided the perplexing questions of the origin of the earth, and *shaped their Gods in mans image*. Gods and man sharing the same domain in time and space.

Judaism and Christianity turned the question around and put God in the centre of the universe.. *Making man in the image of God, they were forced to face the mystery of mans creation with endless consequences, as we shall see further on in this essay*.

7.3 A Creator God and his Children

The concept of an awe inspiring Creation by an all powerful God comes to this world through Moses, the greatest of the Hebrew prophets, born sometime around 1300 BC. Moses, a born leader, moralist and politician was the son of a Hebrew mother and educated as the foster son of an Egyptian princess; he was predestined to become the leader of his people. Having murdered one of the Egyptian foremen he fled to Midian beyond the gulf of Akaba, where he married Zippora the daughter of Jethro a Midianite Priest.

With events that have no biblical explanation came the happening that changed the life of Moses. He was tending his father's in laws flock of sheep and goats, when he came to mount Horeb, later to be called Mount Sinai.
And the angel of the Lord came to him in a flame of fire in the midst of the bush, and God called to Moses.

Marc Chagall,
Moses and the Burning Bush

"*Moses I am the Lord of thy fathers, the Lord of Abraham, Isaac and Jacob*", and Moses hid his face because he was afraid to look upon God. God told Moses to return to Egypt and liberate his people. Moses[41] said, "*Who am* [42]*I that I should go to Pharaoh and bring the Israelites out of Egypt"*?
And here comes maybe the most crucial statement in the Pentateuch (Five book of Moses), I AM THAT I AM, a statement that still vibrates in our time. "*You will say unto the children of Israel I AM has sent me unto you*". This is my name forever.
I AM THAT I AM, in Hebrew יהוה, YAHWEH or JEHOVAH has been a subject that has fascinated historians' and theologians and lead to endless discussions.

YAHWEH comes from the Hebrew "*to be*". The name originates from "***He who brings into existence",*** or in other words the ***Creator***.

The concept that God existed and whose name could not be mentioned and could not be described became the foundation for a completely new set of belief, a new abstraction becoming the focal point of mans endeavour. Man, created in Gods image, Children of a Creating God, would see himself as a creator too, carrying within himself the seed of his destruction and his expulsion from paradise. Man would no more be the victim of erratic Gods struggling between themselves for supremacy, but would become the partner of יהוה the only God and part of his creation.
This God יהוה entered into his first covenant with Man, Adam[43] establishing mutual obligations between Adam and יהוה[44]. He now entered into a third[45] covenant, this time with the children of Israel. יהוה Would liberate the children of Israel from slavery and bring them to the Promised Land, and in return they would become his chosen people spreading the word of God amongst the people of the earth.

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[41] *So Moses, just like Abraham before him started to negotiate with God.*

[42] *Moses was unable to speak clearly since his foster uncle the brother of the princess who educated him, put a piece of charcoal in his mouth as a baby, incapacitating his speech and making him unable to compete for the throne of the Pharaoh, and in this way protecting his own right.*

[43] *From the Hebrew Adamah, meaning earth*

[44] *or as Abraham Joshua Heshel has described it in his book of Jewish Philosophy "God in Search of Man"*

[45] *The second covenant being between God and Noah, where God, after the flood, promises not to destroy the world because of mans transgressions again the result of a negotiation between God and Noah.*

Not by the sword but by the book;
Not as missionaries but as an example.

For mans awareness for his capacity to create, the covenant was a revolution, a landmark in mans mental evolution, a mental tool shaping mans mind to cope with the change that was to come about in the millennia ahead. A people became a community in their belief in a single creating God and his creation. The ideas of a creator God, a covenant and of mans creation in the image of God were woven into a single texture of belief that has survived to this day.

Through the Pentateuch[46] Moses led man to understand his part in creation and to find his share in its processes.
Moses role in our story is as prophet of the single creator God.
Belief in one God makes it easier to envisage a creator, in particular if there are no competitors with whom to share the credit.
While the Hindus were blinded by the creation, for the Jews it was the justice of יהוה, that dazzled them, requiring righteousness as their fulfilment of their part of the bargain, creating the necessary balance between the realms of the flesh, the mind and of spirituality.

Freedom and Justice, intertwined, counterbalancing mans creativity, with righteousness, based on the covenant with יהוה, became part and parcel of what was later to become the best part of enlightened western democracy.

Turning our eyes to the future, Christianity played a leading role in creating an ideological framework justifying the discovery of our power to create. While for Plato nothing new seemed possible, confined by his theory of forms he could get no closer than the perfect forms that had existed from eternity and Aristotle in his own way refused to accept the possibility of any new institution beyond the Hellenistic city state.

St Augustine 354-430 AD, on the other hand would offer man a new all encompassing role in the drama of time, making possible the unfolding of mans creative powers[47], in a novelty laden future, in a process dominated by the Church, keeping the mind and soul wrapped in a cloak of dogmas.

His ideas would dominate Christian thought for the next 1000 years, until Dante's pen and Massaccio's brush would depict another grimmer reality heralding a separation of the value spheres, into the sphere of reality, the sphere of the mind and the sphere of the spirit, the formulation and interpretation of which only would receive a clearer interpretation with Immanuel Kant 1400 years later.

With the coming of Christ, time shifted from the cyclical to the linear, and with mans unlimited ability to create, he would, according to Augustine, manifest his covenant with the creating God. Augustine's story begins with creation and ends with the last judgement. Every soul is unique following its own destiny to heaven or hell through creation, for the love of God and joining the eternal City of God. The latter concept being the name of Augustine's greatest achievement, was written on the ruins of the crumbling Roman Empire heralding the

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[46] *Five Books of Moses*
[47] *"[Even] If I am mistaken, I am.", analogy with Descartes 1300 years later, quote from Augustinus.*

medieval Christian state, and according to some[48] embodied the ideas of the 20th C nation-state, which in it's colonization of the spirit turned the merits of modernity into disaster.

Christianity had now taken the powers of their creator internalising them in institutions that had became parts of the processes needed to fulfil the covenant for them alone. Catholicism monopolised the framework within which the covenant was to be fulfilled, marginalising the Jews, expelled them to the fringes of society and sowing the seeds of anti-Semitism and through romanticisms reaction against the separation of the values spheres, 1600 years later, the holocaust.

7.4 Islam and the Judaeo-Christian Concept

From a superficial perspective ISLAM may be perceived, as being a third variation of monotheism a continuation of the Judaeo-Christian concept. The contrast between the Judaeo-Christian view of creation and its creator, and that of Islam appears wherever we look, which makes it very difficult for Jews and Christians to feel comfortable with Islam.
Islam finds the very idea of creation unappealing. The first, yet decisive piece of evidence is the Muslim view of the Holy Scripture. The Muslim counterpart to Jesus is not Mohammed, but the Koran.
In the Christian faith Jesus is perceived as the *incarnation*[49] , the taking on in human form as the son of God. But Muslims believe in *inlibration*[50], the embodiment of Allah in a book, the Koran.
The mystery and awe that Christians feel toward Jesus Christ, is comparable to what Muslims feel towards their book, the Koran. Few dogmas are more difficult for Jews and Christians to understand than the *uncreated* Koran. The difficulties that Christians have in accepting the Muslim concept of *inlibration*, the Jews have in understanding the Christian concept of *incarnation.*

The more we read and understand of Islam the more we begin to realise that the Muslims exempted their holy scripture from the domain of creation. The Muslim God Allah, although he was a kind of creator, had a character quite different from that of the God of the Jews and the Christians. Allah created not by *making*, but by *ordering*, not by *work* but by *command*. The *creation* of anything occurs when he *decrees* it into being. The Muslim God is not renowned for his making in the beginning but as an *orderer*, *a commander of life and death, even* unto this day.
The Judaeo-Christian God is awesome for his creation in the beginning, and he may intervene, although this is debated, by divine providence. The Muslim God Allah, however, awes us by his continuity, his presence, his awareness, his inscrutable arbitrariness, and his decrees.
Allah, after having decreed the world into being, after six days, not having worked and having no reason to rest, just mounted the throne of authority. From there he continued to rule over life and death over every earthly act.
Why did Allah order man into being?
Scatterers "[**51.56**] *And I have not created the* ***jin****n*[51] *and the men except that they should serve Me*

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[48] *Piet Leupen, Amsterdam, Gods Stad op Aarde*
[49] *Literally from Latin, become in flesh*
[50] *From the Latin liber meaning book*
[51] *Jin(n) is an invisible demonic creature in the Koran that can take control over man*

The people of the Koran call themselves Muslims, from Islam, the Arabic word for submission or obedience.
The Koran repeatedly reminds us that Allah's creatures are also his servants or slaves. While the Jews negotiated with their God and became a partner in Creation, and while the Christians institutionalised mans covenant with a creative God in the City of God, the Muslims accepted submission. *For believing Muslim to create is a rash and dangerous act, an option only open to Allah, for the Jews and Christians it is part of the covenant with God.*

Paradoxically, from the turn of the millennium to 1300, lacking any serious opposition, Spain and North Africa experienced a cultural golden age under tolerant Muslim rule. In Europe, still in the dark ages, the church struggled to quell opposition consolidating its rule over the heathens, Rome's population had dwindled from 2 million to about 12 000 persons and having become more or less uninhabitable, the Pope moved to Avignon. Worldly knowledge was not common good anymore, conserved for centuries in monasteries under the auspices of the church following St Augustine's role of creativity, and did not reappear until the renaissance.

The barriers to creativity prevalent in the Muslim concept, finally placed them at a disadvantage as the Christian world consolidated its power, started to gain momentum through the renaissance, the Muslim and Jewish expulsion from Spain and Columbus discovery of America in 1492.

Ever since scientific discovery became the main tool for exploitation of the earth, the Muslim world, relatively speaking, started a slow retreat. Since they could neither navigate the oceans nor build ocean-going ships they could not compete on the new trade routes to America and Asia. As the west exploited America and amassed riches, successively separating the three value spheres, the monolithic Muslim world commenced their decline. They lacked a universal concept of time and could neither navigate at sea nor control and synchronize large armies on land. The chronometer invented by Harrison in London in the 18th C still remained an ornamental artefact in the Sultans palace in Istanbul 100 years later.
Their autocratic concept of leadership, lacking the concept of power sharing, with no educated middle class, perceived no value in the printing press, which only came into operation by the end of the 19th C, 400 years after Gutenberg, and then only as a disseminator of decrees from the Sultan himself.
While the Christian world"*invented",* the world of Islam "*de-invented*".
While the western world disposed of God through reason colonizing the soul, the Muslims remained true to Islam, the obedient servants of Allah having "*Not been created except that they should serve him*".

7.5 Man as an Image of his God

My personal observation is that believers and non believers alike be they from the West, the World of Islam or the East, generally tend to live in the image of their own Gods. In rash moments we may think that we have escaped the mould of our culture, and that the decisions we make are made of free will, but this is very rare.
Much of what we opt to do or not to do is *embedded in code* formulated by sages a long time ago, and when we opt to convert, to abort our in-born path of cultural evolution, we pay a high price in social isolation and disparity with respect to our surroundings.

The creativity of the west, among Christians and Jews, is embedded in their story of a covenant between a single creating God and his people, a difficult, stubborn, arrogant, argumentative, independent, negotiating and creative sort of people, unique among all the people of the world.

It is *our* core beliefs, *our story of being*, that has lead to an overexploitation of the world, not the core beliefs of the Hindus, Confucians, Taoists Buddhists or Muslims. We and our culture carry the responsibility for the condition of our ecosystem, and carry the responsibility to turn it right.

We have chosen the path of one-sided modernity, we have not only separated the value spheres, which gave us the decency and merits of modernity, enlightenment, human rights, justice for all and feminism, but we have also allowed reason to colonize the world of the spirit, alienating us from ourselves making man the centre of the universe.
We know much about "*how*" but very little about "*why*".
We have on the one side opted out of the covenant with Yahweh; we have not fulfilled our share of the bargain. We have eaten from the fruit of the tree of knowledge, and "*will surely die*" if we do not counterbalance freedom and creativity with justice and righteousness. Without justice to all living creatures we have forfeited our rights as formulated in our covenant.
Freedom without Justice and Righteousness is the core of the issue. As the dwindling resources of the earth, the pollution of our environment accelerates, and the complexity of our technical systems suck more and more resources from agriculture, healthcare and education, we shall have to decide for ourselves whether we have a covenant or not, whether Freedom and Creativity is a God given right, or if there also are obligations attached, albeit they nowadays are written in small letters on the back of the contract.

The covenant is that part of our heritage, uniting the realms of science, meaning the physical world and our inner vision of it and the world of spirituality, uniting "*This World*" with our inner selves.
We need to take back what is ours, our lives and our time from the "machine" that has taken control over us, work for a fundamental change in our awareness and in the priorities we choose to make in "*This World*".

And said the woman to the serpent.
Of the fruit of the trees of the garden we may eat,
but the fruit of the tree in the middle of the garden had said God,
not shall you eat of it, nor shall you touch it,
lest you die." (Genesis 3:2-3)

8. Final words and Contributions to a future Manifesto.

These final words are a summary of the four previous short essays, and are an attempt to highlight some of the issues that could be part of a manifesto for the Exergy Group of Sigtuna, Sweden, an environmental group dedicated to the education of themselves and the general public. The underlying assumption is the existence of a common set of values that not only stresses man´s relationship to other men, but also man as part of creation, and his or her responsibility towards creation. We must shift from a set of values based on self interest[52] to a set of values based on common interest[53] and good for all. This is the core in change of attitude that must come about. Man does not live alone; communion must permeate our culture from our ideas, hopes and aspirations to the practical implementation of our supporting systems.

1. Our present predicament is the result of a historical process that has been ongoing for more than 2000 years. Our language, our symbols and metaphors are part of our cultural and historic inheritance, and it is in this wealth of knowledge where we must find the inspiration and energy to move forward in the third millennium.
2. Western civilization as it emerged beyond the industrial revolution is now consuming the ecosystem on which it is built, as well as the bio and cultural diversity that in it carries our key to the future. It has reached the end of the road.
3. Laws of nature are not negotiable and must become part of our cultural heritage, embedded in our ethical and legal system. Today they are just part of our education. Market dynamics will not be sufficient to curb abuse and waste. Laws must be put in place that enables conservation instead of exploitation and that reflect the real meaning of the concept *covenant*.
4. The nation-state-industrial complex must be restructured within our democracies. Promising us a false messianic vision of an unsustainable welfare state, democracy must be turned around and energized from the base upwards, embodying a new set of values, civic responsibility and inspired with a mission for long term sustainability for all *living*[54] and for mankind.
5. The processes of re-engineering of our society and our industrial base must be one of the prime objectives in the near future. Trans-national corporations must shift their emphasis from exploitation to development and conservation, and our research facilities must give absolute top priority to the task of systemic thinking and re-engineering, built on the laws of nature, respect for the ecosystem and a re-establishment of morality.

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[52] *What is good for me alone, in the sense that the right of others only can be seen in the light of my own needs , in their sentimentality*

[53] *What is good for us all, in the sense that my rights are linked to the rights of others*

[54] *Living should here be interpreted in the broadest sense.*

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[55] *Holon is a concept introduced by the Anglo-German writer Arthur Koestler*