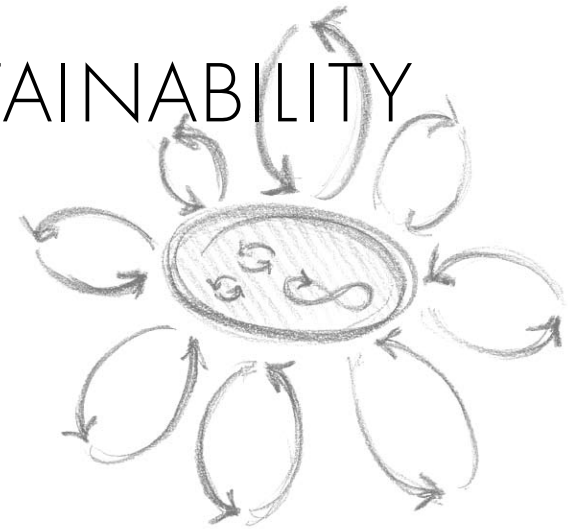
DESIGN AND SUSTAINABILITY

by Jens Hvass



A three-day workshop on Design and Sustainability was held at Hokkaido Tokai University on January 24 to 26, 2000 for a group of design students and architecture students. This essay will give a brief outline of the workshop and its aims, it will present the primary understanding tools of the workshop toolbox, and it will try to discuss aspects of the background and potential of the systemic approach, which was the key tool of the workshop.

Aoyama-dori, one of Tokyo's main arteries. In a systemic perspective, the road system is an important part of the circulation system.

We are at the threshold of a new millennium. Industrial society as we know it till now, and the industrious cultural mode it has developed, has proved to be a hazard to the global environment. Due to the heavy dependence on limited and non-renewable energy and resources the present mode of functioning is doomed to be a brief bracket in history of Man. In the immediate future, we as architects, designers and human beings will be faced the challenge to develop more appropriate, harmonious and healthy ways of human society. Therefore this workshop put focus on how we can understand architecture and design in the perspective of ecology and sustainability.

We live in a global situation. We are many people on the earth, and we have to find ways to share it not only for now, but also for the future. If we analyse the way of life in the rich countries from sustainability perspective it becomes clear that it cannot go on forever - it actually cannot go on for many more decades - and it becomes evident that the solution is not just a question of minor adjustments of the present state. The global ecological system is severely threatened by industrialised society, and the negative feedback also on human life is getting stronger and stronger. Industrial society as well generates severe alienation and metal pollution.

If you look around in Japan it may not look that bad - still fields and forests are green and abundant, and seemingly still the Pacific Ocean can take the load of waste and exhaustion from the Japanese cities. But the ecological problematic is global. The Japanese need for food, timber and paper is inflicting landscapes and life conditions all over the world. The side effects of the life styles of the rich countries like Japan and Denmark have global implications, and our industrialised life style is a heavy burden

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Modern sanctuary at the foot of Fuji-san, the holy mountain of the Japanese.

to the environment all over the world.

New settlements in outer space and development of underground cities or giant city-scale building structures in Tokyo Bay might nurture the dream of new beginnings in unspoiled, virgin settings. But such "solutions" do not solve the present problems - they rather add to the present unbalance of the human presence in the biosphere. As a starting point we have to realise the unsustainability of the present situation as well as the typical solution modus of our present society.

Some years ago World Watch Institute estimated that in order to reach a sustainable situation, the highly industrialised societies will have to reduce their material consumption with a factor 10 to 20. We may say that in the future, there will be for everybody's needs, but not for everybody's desires. Any sustainable scenario will necessarily have to question the desire industry - the present right of the free market to generate desires at random.

For both energy and raw materials we are forced to learn to distinguish between renewable and non-renewable sources and base our life and society predominantly on renewable sources. We must stop the exploiting attitude towards the biosphere. We must find ways of living in the global eco-system, which ensures the ecological niche not only for human beings but for all species of plants and animals as well. Any further action that is detrimental to our environment and makes it less attractive to next generation must be avoided.

It may take time to realise how, but through our work as designers and architects we have a strong influence on the future development. In broad terms we can say that we are designing the mode of exchange between the human world and the environment. This is true for the whole range of our work field. Our work process is a continued series of qualified choices, and virtually every single step throughout our process, every aspect of our profession, involves questions of sustainability. On basis of a deep understanding of the dynamics underlying the present situation and a continued qualification of the goals for the future, we may through our design activity be able to add to a future, in which human activity takes a much more balanced and sustainable position in the global eco-system. The shaping of a more sustainable future will call for the wholehearted concern and concerted creative potential of several generations of architects and designers.

Using only 5 or 10 % of our present material consumption will involve tremendous changes - not only in technology and technological terms. It will even more involve changes in the way we organise ourselves, and in our basic attitude to the living world around us. The more we actively search for these changes ourselves, the less we will be forced to do it from the environment. So - taking on the challenge of designing sustainability is creating freedom and life space for future generations.

The workshop design

The three-day workshop at Tokai University on design and sustainability was structured around three sessions that provided a series of integrative tools for understanding and communicating our present and future. By means of these tools it was the aims to present a perspective on *what* we can do as designers and architects in order to direct our present state of living towards more sustainable patterns.

Whereas in the beginning we investigated future developments and questions of ecology and sustainability in a broad perspective, gradually towards the end of the workshop we focused on our role as architects and designers. And the final part of the last plenum session addressed the question: What does this imply for our studies and the education at Tokai?

Such discussions easily - but not necessarily - get very diffuse, as ecological problematic tend to expand far beyond the scope

First homework assignment:

Create a factor 20 scenario based on the TAO model, with a material consumption of 5 % of the present, in which we are happy, live in fulfilment and harmony with each other and our living environment.

If love is the real thing: Give love, not presents!w

Today Tokyo's rivers are converted into transportation corridors. Gone are the beautiful river scenes of the past and the rivers as links to nature. The price measured in destroyed recreational urban spaces and natural qualities is unpayable.

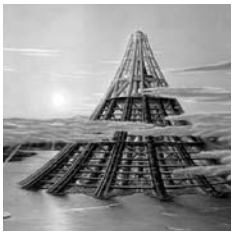
of the individual profession and to explode most established structures of understanding. Our presently highly sectored and specialised knowledge does not provide the proper integrative perspective. Global and local are interwoven, as are architecture, psychology and world-view - somehow everything is interconnected. Therefore, as a working basis for the workshop, a number of models for understanding were presented, and homework, group discussions and plenum sessions were strongly structured by corresponding matrix sheets.

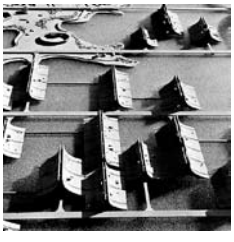
The three-day workshop programme was composed by multiple elements ranging from various ex cathedra inputs to homework, group work, plenum presentations and plenum discussions. These elements were grouped in three movements; each starting with an introduction and a toolbox that gave the tools for the group and plenum session of the day.

Each toolbox took a starting point in a series of important terms, which were defined, exemplified, and in relevant cases semantically investigated - like for instance the root meaning of *economy* and *ecology,* derived from Greek language [*oikos:* house, *nomus* and *logos:* numbers and knowledge], denoting respectively *house administration* and *house understanding.* Even though the general knowledge among the participants on ecology and sustainability as a starting point was rather low, these terms gave us the necessary shared vocabulary for the group and plenum discussions. The presentation of these important terms made way for the central element of each toolbox: the introduction of a discussion and understanding model.

Each toolbox involved a new model, and day for day there was an increasing complexity in the way in which the workshop was handling the questions on design and sustainability. The first model was the scenario model, which is very straightforward to use; the second model was a homeostasis model, whereas the third model was a systemic model, which represents a highly complex mode of understanding. After the presentation of the models followed a series of examples on how these models were used in society in general, or could be used in design processes. On that basis - important terms, model presentation and model exemplification - group work and homework were introduced. Later in this essay the individual models and some of the exemplifying material will be further presented.

The list of important terms might give a first hint of the discussion platform. For Toolbox I it was *ecology/economy, eco system, ecological niche, sustainability, unsustainable, renewable and limited resources, factor 20, deep ecology* and *shallow ecology, eco fascism* and *recipient, utopia, scenario,* and *scenario method.* For Toolbox II the important terms were *system, homeostasis,*





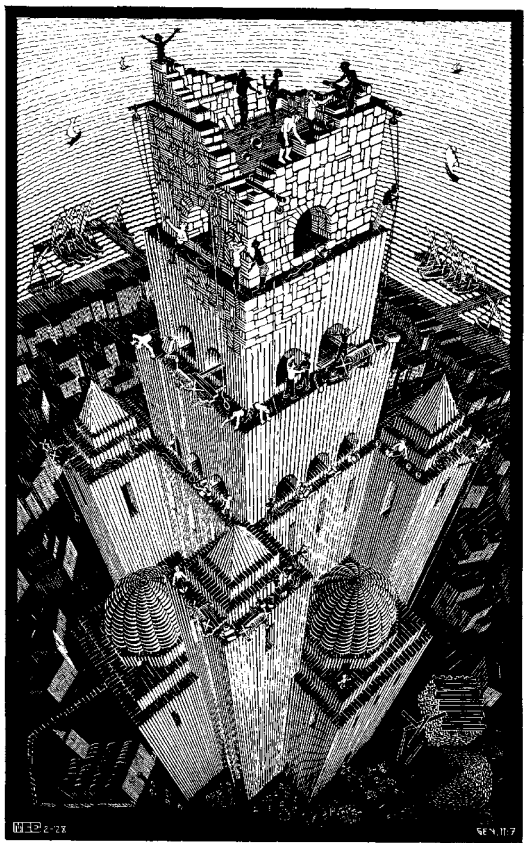
Since the late fifties, Tokyo Bay has been the Promised Land for the overpopulated Japanese capitol. To the right it is Kenzo Tange's *Plan for Tokyo* from 1961.

With its towering 4000 m Taisei Corporation's Tokyo Bay project: *X-SEED 4000* from 1990 (to the left) was projected to be even higher than Fuji-san - or rather was it made to give Taisei Corporation publicity.

homeostasis model and *feedback mechanism*. And for Toolbox III, the important terms were *paradigm, Cartesian world-view, cause and effect, side effects* and *bi-implications, new paradigm, a systemic or holistic approach, natural succession, symbiosis, bio-diversity, Agenda 21* and *Local Agenda 21.*

When dealing with the future in a workshop like this, the work method by necessity must be open-ended. There exists no key, no fixed list of results, and the positive outcome is fully dependent on the contributions from the participants.

From the planning period, it was presupposed that the group and plenum sessions might turn out to be problematical. From the existing learning environment, neither teachers nor students are used to openly discuss and handle disagreement. Therefore all group work and homework were strongly structured, and the process arranged in a way that dissenting opinions and conceptions inevitably would occur. Each session was structured on basis of sets of pre-made matrix sheets that were filled out first individually, then co-ordinated in groups, and finally in plenum.



M.C. Escher: The Tower of Babel, woodblock print (1928). God responded to this giant scale attempt to reach (or to equal) Heaven by giving mankind diverging languages.

A consensus workshop without the complementary dissenting element activated hardly makes sense. And as a moderator I made continued efforts to surface and sharpen dissenting fields of conception as a tool for clarifying the consensus - both in the integrative process from individual work to group consensus, and between the group presentations in plenum.

Open disagreement is not very Japanese, at least on the surface; and due to traditional conventions of harmony (the connotation of *wa*) all too often opposing views are not adequately manifested. This may have its origin in a feudal past of a rice culture, and it may add a certain intangible depth to a romance. But disagreement does not evaporate from hiding it, and structured disagreement is very creative. It is the core of the democratic process, and it is a sharpening tool for designers and scientists alike. And it is indispensable for the outcome of a consensus type workshop that every participant openly state whatever they have in mind, no matter what was said already. As the main moderator for the workshop I can say that it took efforts to stimulate the debate - it actually had to be provoked. For many of the participants it was the first time to experience the group work, but generally the reaction from the participants to the potential of sharing and openly debating was overwhelmingly positive.

The scenario method

The first group work and plenum session was based on the scenario method. A scenario is opposite to simple progressions of a single or some few factors at a time - like population, economical growth etc. A scenario is an *integrative* method, and the scenario method is good for handling complex *qualitative* problematic - like our future. It can be supported by quantitative elements, but not be reduced to the quantitative. The scenario gets better and more precise in its statement, the more different factors you are able to integrate.

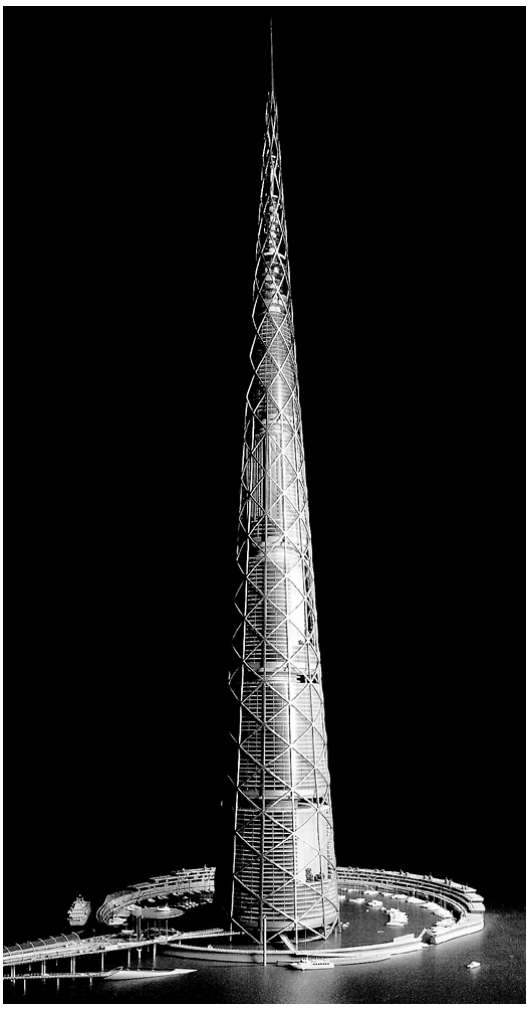
You find examples of scenario everywhere - in magazine articles and research as well as in literature. They often demonstrate how things that are inherent our present situation, hidden or maybe not yet addressed as important issues in our present situation, in a future scenario might have a strong positive or negative impact on the situation. The scenario inevitably includes an element of interpretation, and the good scenario thus depends on an well-integrated and well qualified interpretation, which much the same way as the qualitative case study includes a qualification of the subject.

A certain group of scenario is the utopia. An utopia, according to *Encyclopædia Britannica* is "an ideal commonwealth whose inhabitants exist under seemingly perfect conditions." The

By tasting the fruits of the Tree of Knowledge, Adam and Eve was awakened to a dualistic reality and expulsed from the Paradise. Japanese and Chinese mythology have no definite myths of fall. But in Christian culture there is a whole series of falls - and repolarisations between man and God - from the first tasting of the forbidden fruits over Noah's Ark and the Tower of Babel to the crucifixion of Christ - and from the renaissance, the gradual conversion to Antichrist, the materialism.

word utopia emerged with the novel *Utopia* written by Sir Thomas Moore in 1516, describing a city-state, Utopia, which was totally governed by reason. The utopia is an integrated scenario depicting our best wishes for the future. Often you meet too the negated, or dystopian, utopia. A famous example is George Orwell's *Nineteen Eighty-four* (1949).

There are many examples of utopia. The Confucian utopia lies in the past - in the pre-historian ideal state based on the virtues and statesmanship of the three legendary Emperors Yao, Shun, and Yü. So does the Christian Paradise. The root utopia of Western culture is the Paradise, a pre-existence before any distinction between good and evil. And the cultural history of the West could be said to begin when Adam and Eve tasted the forbidden fruits of The Tree of Knowledge. Subsequently God expelled them from Paradise and doomed them to live a laborious and uncertain life. This Fall of Man represents the birth of dualistic mode of existence - the capacity of distinction, the ability to see yourself and your neighbour from outside and to see yourself as separate from nature. Man became able to do evil.



Norman Foster/Obayashi: Millennium Tower (1990), proposal for an 840 m high structure in Tokyo Bay. The 170 stories would accommodate for 50.000 people.

The Christian Paradise is also existing ahead of us - as something we can regain access to after a life on earth in misery and suffering. Only after the renaissance, man started to envision a Paradise on earth - as in the communist vision of a future society, where few had too much and even less had too little. This scenario has had a tremendous influence to the 20th century.

But the scenario is not only far ahead dreams of an unreachable realm. The scenario method is widely used by the military as a strategy tool. What happens if, if, if, and if certain patterns of action of a large number of players are involved.

Often there is a conceived conflict between "utopians" and "realists." But this is a false opposition. The vision needs the realism and relatedness to our present to have any meaning; and the small steps of the realist needs the infusion of vision to have any meaning beyond simple exercising of power. Today the pattern of actions that defines the future is a result of a sum of disparate, disintegrated, fragmented and often unconscious actions. In shaping a sustainable future we cannot simply rely on small sectored steps forward based on extrapolation from limited perception of the present. A teacher of the Royal Academy in Copenhagen, where I had my architectural education, expressed this in the beautiful choreography: *Three steps forward and two steps back.*

This perspective indicates a dynamic relation between our visions and future expectations and the immediate local change and improvement. Is a tool of conducting a sum of single actions into concerted efforts towards a desired future scenario, and most importantly it is a way of keeping also the far ahead scenario subject to constant evaluation. Accordingly the two first sessions of the workshop was performed on basis of double matrix sheets, one for a scenario 30 years ahead, and one for a 10-year perspective. These double scenarios should be interrelated according to *three steps forward and two steps back.*

Recently (Dec. 1998) the Danish ministry of environmental issues published an investigation based on the scenario that all Danish agriculture was changed into ecological production. With a starting point in the established scenario it is analysed which changes of the present situation it will imply, and the economical consequences are estimated. Conclusions based on such investigations will always operate with a certain uncertainty. But it is estimated that a nation-wide transformation into ecological agriculture will be possible, on the condition that that the consumer as now is willing to pay a 30% overprice for the ecologically grown products, and still in 10 years from now a 20 % overprice. And then the ball is back to the consumer - are

Christ crucified on the Tree of Knowledge. An Italian fresco painted in 1421 by Giovanni de Modena in Cappella dei Dieci, S. Petronio in Bologna.
To the right, Jesus gives back the sight to blind people. Fresco from 13th century.

we actually willing to pay the price for increased quality, for less poison in our food etc. and thereby create the possibility for the farmers to produce in more sustainable ways? In the market economy the conscious consumer has a strong influence on the pattern of development. Through our pattern of choice, we are acting in the world, whether we realise it or not.

We all have images of the future; we all have hopes, fears, and expectations about the future. Through the first session of the workshop we shared them, talked about them and tried to integrate them into a consistent scenario. A strong understanding of the dynamics moulding our future will be a powerful tool for our design process. Thus the first two matrix sheets, one for the year 2010 and one for the year 2030, were listing vertically *global issues, kitchen and agriculture, family life, work life, education, information structure, downtown and suburbs,* and *transportation and circulation,* and horizontally *think, fear* and *hope.*

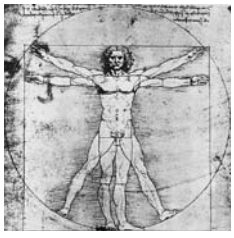
From sharing our fears, we can clean ourselves from negative hold back, and we can detect areas calling for improvement and preventive actions. From sharing our hopes for the future, a stronger vision may arise together with strategies to make them into reality.

As tools for the group discussions, big posters with same structure as the A4 matrix sheets were used. These were hung up and presented simultaneously in plenum. The important thing was not the individual boxes of the matrix sheets, but the resulting understanding of integrative structures knitting the multiple factors and facets together into a strongly integrated scenario. The brainstorming nature of the process was directed towards establishing a still stronger inner agreement and congruency between the individual matrix statements.

The two matrix sheets for the second session were identical except for the horizontal listing, where *think, fear* and *hope* were replaced with the three parameters of the TAO model: *technology, attitude* and *organisation.*

The purpose of the third session was to put architecture and design into a systemic frame of understanding. The related matrix sheet vertically listed a series of parameters each focusing on one aspect of the systemic approach. They were: *system outline, system structure, inner dynamics, patterns of development and change, exchange with surroundings, system seen as part of a larger system, system seen from part of the system,* and *others.* Horizontally there were only two categories, *description* and *evaluation of sustainability.*

Leonardo da Vinci (1452-1519): study of the proportions of the human body according to Vitruvius, as inscriptable in both circle and square.



Group work as integral art of the Tokai workshop on design and sustainability.

On the third day, a group of participating teachers presented a consensus conclusion as part of the plenum presentations. And after presenting and discussing the group works on basis of the systemic model, the workshop ended up with an evaluation addressing the question: what does this mean for our studies and education at Tokai University?

The TAO model

The TAO model is a homeostasis model, and homeostasis is a concept derived from modern systems biology. Homeostasis implies that the individual parts of a system tend to keep each other in equilibrium. If one element is changing, strong feedback mechanisms from the other involved elements - as represented by the arrows in the model - tend to re-establish the prevailing order. When a homeostatic system is disturbed, built-in regulatory devices respond to the departures to establish a new balance - this process is called feedback control. Each element can only fluctuate within certain limits - herein lies the basis of the stability of the system. Major changes cannot take place for only one component in the system. It takes a redefinition of all key elements of the system.

In 1977, the Danish biologist and society visionary, Jesper Hoffmeyer, wrote a book on ecology, *Økologiske produktivkræfter*

Second homework assignment:

Choose something you know very well. Put it into the systemic framework of understanding. Se it as a living system or as a part of a living system.

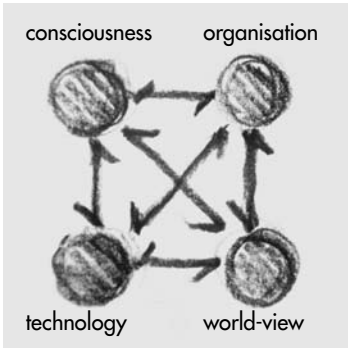


Fig. 1: The homeostasis model from Jesper Hoffmeyer: *Økologiske produktivkræfter* [Ecological Productivity Forces], 1977, p. 19.

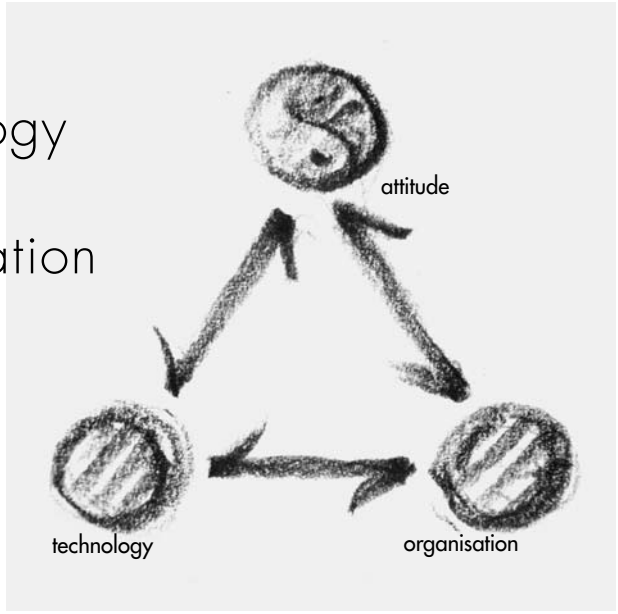


Fig. 2: The TAO model - Technology, Attitude and Organisation - used as basis for the second session of the workshop.

[Ecological Productivity Forces] (1977). In this book he applied the homeostasis principle on the development of human society through history and put up four key elements, *technology, organisation, individual understanding* and *world-view/paradigm of understanding* in a homeostasis model (see fig. 1). And he demonstrated how changes in history had implied simultaneous changes in all these four key elements (see fig. 3).

During my study time in the early eighties however, we experienced continued problems regarding the polarity of *world-view* and *individual understanding,* when presenting this model as basis for discussions. And at some time we took the consequence and squeezed these two into one element: *attitude*. We thus had the TAO model: *Technology, Attitude* and *Organisation* (see fig. 2).

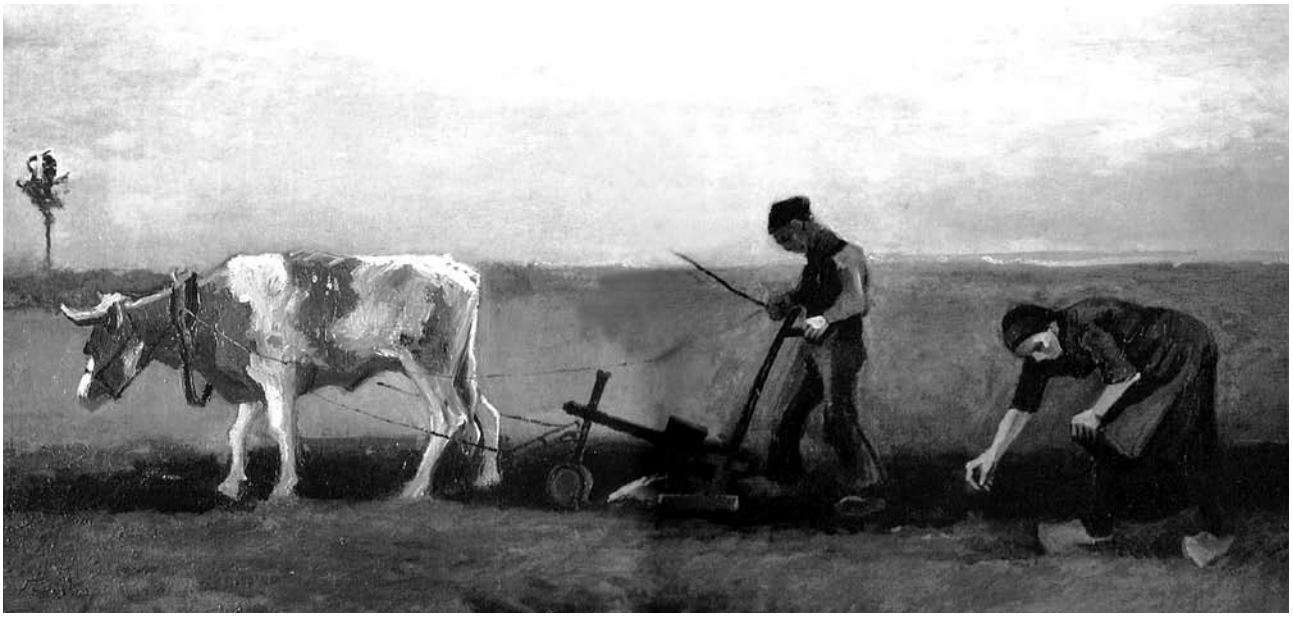
The simplification into the TAO model may exclude certain important nuances - and therefore I present here the original homeostasis model of Jesper Hoffmeyer as well. But for our use - intending to put focus on the importance of the human attitude to nature and bring the ecological discussion out of the narrowness of purely technological and organisational realms - the TAO model was fully sufficient. This was true for the Tokai workshop as well - the simpler basic understanding tools, the lower is the threshold for active participation in the workshop.

Calligraphy by Shin'ichi Hisamatsu: *Do* or *michi, path* or *Way.*
This character appears in words like *kendo, shodo, sado* and *dogu* - the way of the sword, the brush, the tool and tea - and it implies a certain life and work attitude. In Chinese this is *tao,* the character denoting Taoism.

The TAO model makes it clear that even though we already have the sufficient technology for an ecologically better and less unsustainable world, it does not necessarily come through. Most healthy technologies, decentralisation, small scale, combination of low-tech and high-level information etc. have severe difficulties finding their natural place in our present mode of organisation. Despite many beautiful words on coexistence between man and nature, our present political and economic system as well as our attitudes and perspective of the world represent a deep resistance to the necessary changes.

On the personal level, we may try to change our life patterns. And through that we can make changes within certain limits. But no matter how idealistic we are in our aims at transforming our own lifestyle and immediate life surroundings, we can only act within certain limits. We are entangled in the spider web of a highly complex and highly unsustainable society.

A highly significant aspect of the attitude element in the TAO model is our view of nature, and throughout history of man view of nature has changed hand in hand with changing understandings of ourselves and our gods. In European context we can segregate a pantheistic, medieval, mechanistic, romantic, or holistic view of nature, and the list could easily be far more differentiated. But generally we can say that the process that was



Vincent van Gogh: Planting potatoes, oil painting (1884).

initiated with the Fall of Man, has reached its extreme. The ego has developed to the point where it is a de facto structuring the centre of the world. Never before has human beings perceived themselves so separate from nature or manipulated nature as today, and maybe never before has he been so alienated from his own nature. But seemingly out of the present situation, a new consciousness is emerging, in which our skills and knowledge and can be addressed not only manipulation and exploitation of our surrounding nature, but also a reconnection to our inner and surrounding nature.

In the Japanese tradition, Shinto perceptions of *kami* in a spirited nature still prevails together with a Buddhist notion of nature which is not distinguishing between nature of Man and nature of surroundings. And most Japanese people would unhesitatingly agree that Japanese people love nature.

But - when looking at how Japanese people shape their natural surroundings, there is little sign of love of nature - no sensibility towards landscape. And judging from what can be seen it might be more true to say that Japanese people fear nature. The urban fabric exhibits little efforts to maintain natural qualities, and the urban grid order is extended to most arable land. The tiniest rivers are put in concrete, and even inside the dikes the rivers are not permitted to play with the riverbed according to their nature.

Sticker from a telephone box in Gion, an entertainment district in Kyoto. Judging from the pleasure advertisements, a considerable share of Japanese men seems to search the female nature (and thus their own desire nature) through schoolgirls.

Everywhere images of control dominate. So we might say that Japanese people love controlled nature or cultivated nature - that might be true for the human nature as well.

The mode of use energy is a primary characteristic to a culture, and many of our present problems regarding ecology and sustainability are related the way we use energy. The use of fossil energy, like oil, gas, and uranium, together with a series of technological inventions made possible the industrialised culture.

In *Økologiske produktivkræfter,* Hoffmeyer analyses how major changes in the homeostasis of the human society through the times correspond the way we have used energy. And he puts up a landscape (see fig. 3) in which each of these homeostatic balances have been prevailing, together with a train, which has to cross a mountain ridge to a new valley with every new major homeostatic reorganisation. The hunting tribes, the nomadic people, the agriculture civilisations and the industrial culture all had their mode of extracting energy, and for each of these valleys there exists a certain mode of culture, distinct to that particular valley. Take for instance the role and nature of the city in each of the valleys. From non-existing and mobile settlements to the possibility of market towns with the establishing of agriculturally based culture, and to a situation where urban life is the condition of most human beings.

Poster from a DDR (1953) on a way towards communism, in which political power, military power and communist state ideology merged into a powerful entity, which literally defined the living space.

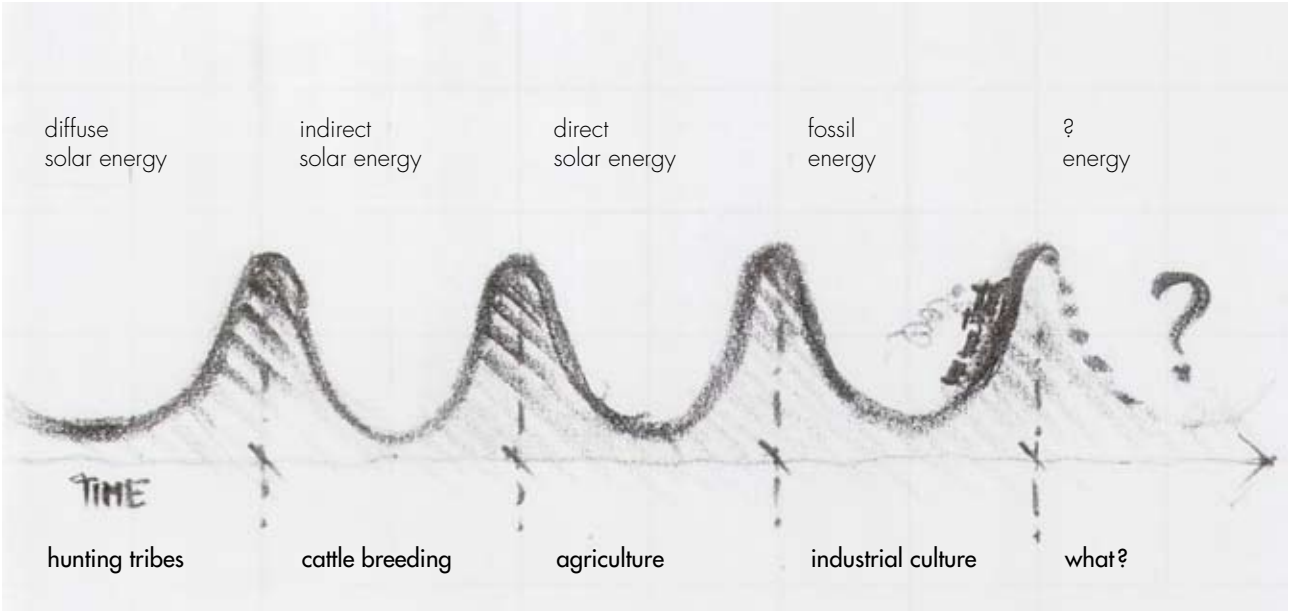


Fig. 3: Major changes of homeostasis in the history of human society. Based on Jesper Hoffmeyer's book: *Økologiske produktivkræfter,* [Ecological Productivity Forces], 1977, p. 27.

According to Hoffmeyer, the first two valleys can be characterised by use of *diffuse solar energy* and *indirect solar energy* - respectively from the hunting tribes providing food through hunting animals and the nomadic people getting their animal food in a much more organised manner. With the continued settlements of agricultural society and the related use of *direct solar energy* through the photosynthesis, a new mode of civilisation emerged. To eat meat represents an 80-90 % reduction of energy efficiency - or a meat eater takes several times more land than a vegetarian does. So besides the spiritual connotations, it is no mystery that rice cultures developed religio-cultural understandings in which meat were sparse or totally tabooed. Big meat-eater countries like USA and Northern Europe exploits a very high share of the world's potential food.

In the very beginning industrial manufacturing was closely linked to the use of water mills for process energy, but industrialisation only exploded with the use of *fossil energy*. In the industrial valley populations exploded and the city became the norm for settlement. The valley & train metaphor may blur the fact that we still in the industrial valley eat food produced in the previous valleys. But also our agriculture today is highly industrialised, as are our cattle farms, fishing and hunting methods. Who's hunting with bow and arrow nowadays?

At present we are on the way ahead from the valley of industrial culture. It is a situation of necessity, it is a situation of a certain strain, and yet it is not really clear what is coming next. Still we need to establish the foundations for the next valley - what is the characterising mode of use of energy? - And what is the reorganised homeostasis of technology, attitude and organisation?

We may have hints for the answer in general terms - minimised use of non-renewable resources, minimised pollution including not only chemical compounds but also mental pollution and process heat. We'll see a strong emphasis on bio-analogous processes and a much higher capacity of employing existing energy currents for our needs, from passive solar heating to solar cells. As our cities are emblematic of the unsustainability of the present situation, we'll see major reorganisations of urban life.

Energy from fission processes has been seen as the saviour of industrial society - and in case we actually become able to employ the nuclear energy that way, we might for a time be able to give industrial culture artificial respiration. But already now the summed up activity level of human beings makes up a real disturbing factor to the global climate. The ozone layer for instance is being still more perforated. And free access to almost unlimited amount of energy from fission processes would most

L.S. Lowry: Landscape in Wigan, oil painting (1925).

E. Delacroix: Liberty leading the People, oil painting depicting the French revolution (1830).

Shop facade from Roppongi, Tokyo. In the bubble economy reality architecture easily gets reduced to carrier of ever-changing commercial messages.

Bubble Architecture - as here Watanabe's: *Aoyama Technical College,* Tokyo (1990).

likely lead to extensive and turbulent changes in the biosphere.

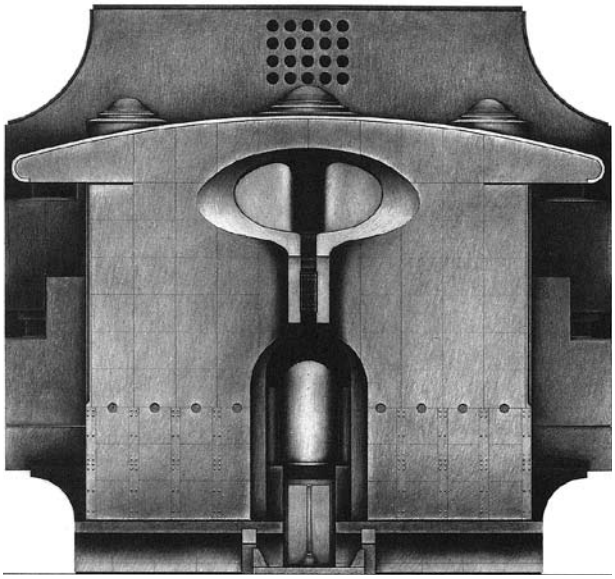
Living plants convert solar energy through the photosynthesis, and plants thus are a kind of solar collectors - primitive, we might think compared to our manmade technological ones, but in their own way very refined solar collectors. Even though we label windmills and active solar collectors as sustainable energy sources, it is important to keep in mind that such means for producing energy take a large investment of energy and non-renewable resources just to establish the start position. The plants do their work based on living processes - all the information needed for the unfolding is contained in the seed.

Brought up in the technological era it may be difficult to see the genius of that compared to real machinery. Hoffmeyer directly talks about "the technological fix." We tend to search for and rely on the technological solutions for practically any problem - even in situations where solutions involving changes in attitude and organisation would be much more appropriate. So in future strategies towards sustainability we will probably see a strong tendency towards bio-analogous technologies, which fits seamlessly into the existing processes of the biosphere, without no or little waste, bi-implications or heat pollution. And in concordance we'll see a mode of solutions, in which the organisation and attitude aspects of the problematic are fully addressed.

Economy and ecology

Towards the end of the second day of the workshop there was a session on the relationship between ecology and economy. Regarding these two, we meet very opposing views. On one hand a strong, almost blind belief among market fundamentalists that the Market will develop ecological characteristics as resources are getting limited. On the other hand a revolutionary conviction that the market mechanisms has to be brought to an end in order to achieve anything nearer to a sustainable situation. In case we have to chose side, the latter may be the less incorrect, but this is not the time for a world revolution. And there may be a middle way in which a market - strongly modified and regulated by cultural, political and environmental principles - actually can be supportive towards developing a more sustainable scenario.

In case our ecological perspective gets too shallow and exploiting (i.e. short-term economic) in motif, we may - from the perspective of the human as the superior being in the world - use our growing ecological knowledge to decide exactly how far we can go in our utilisation, where the limits go, and how much we can exploit and pollute our environment without the total breakdown. This sometimes is labelled eco-fascism. And without strong feedback mechanisms from cultural, political and environ-



Shin Takamatsu: *Origin I,* east facade, new headquarters building for Hinaya, Nishijin, Kyoto (1981).

mental side, the Market will tend to develop in that direction.

An example of a shallow ecology attitude to the environment is the word recipient. A landscape can be reduced to a recipient - and is often so in planning. Rather than seeing for instance the Pacific Ocean as a big living system with a wealth of life, which has its own right to be, we reduce it to a recipient - a convenient waste disposal site for the urban ribbon along the Pacific coast, as even high doses are dispersed in an enormous system. Several economists work on such shallow ecology models - imagining trade of pollution permissions, which for instance makes it possible for a company to export its pollution to other (read development) countries where it is cheaper to pollute.

Eco systems seem to be able to withstand until a certain level of disturbance and pollution - then they collapse and it is too late to clean up. So we have to incorporate a much stronger understanding of the living quality of our environment and sweep away all traces of notions of recipient / waste disposal in our view of nature. Away is gone.

The ecology/economy session of the workshop was opened by a little anecdote: "Between Two Chairs," a small comparative case between a cheap mass-produced plastic chair and an expensive handmade Danish Design chair, probably of Hans Wegner design. It highlights how an initially not so big difference in price is drastically enlarged due to the built in mechanisms of the economic system. Our tax systems generally put the heavy load on the personal income and give full tax deduction for the machinery. This is how the national economies have stimulated investment in new production facilities. But this radically favours the machine-made to the handmade.

There are signs of change: CO_2 tax, air transportation tax, and other "green" taxes are gradually taking over parts of the considerable tax load needed to run a welfare economy. Could we design the tax system fully from sustainability perspective, the situation could be turned around to the degree that the price difference between our two chairs was diminished - or maybe even that the now cheap chair turned out to be the expensive one.

From sustainability perspective - and in order to realise anything near to a factor 20 scenario - we have to make products that last for long time. So sustainability and durable, well-designed high quality products go hand in hand. A chair should be made good enough to be a precious gift for the next generation.

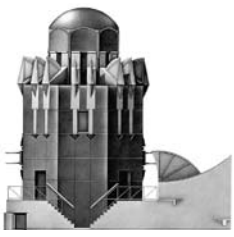
Generally, any more sustainable scenario will circulate less raw materials and products in more efficient ways; and for many areas local products will gain a new stronghold. Thus the free trade understood in market fundamentalist ways - as the uninhibited possibility to circulate any product all over the world in a situation of uninhibited global competition - is detrimental to sustainability.

EU today in practice is one market. We have cheap food in our Danish shops from all over Europe, maybe except for from our local area. We have strawberries all through the year, cherries from the States, *nashi* from Japan - food is flown in from all parts of the world. In early midsummer when the first new Danish potatoes (a true delicacy) can be dug up, we have had new potatoes for months - first from Morocco and Cyprus, then from Spain and France. The blessing of living with the seasons and its cyclic returns is blurred, and our sense of belonging to a certain well-defined food region or kitchen is rapidly disappearing.

In the perspective of ecology and sustainability the principle of free trade can only be maintained in case transportation and production costs are raised to the level where they have internalised all environmental costs. And it is an open question whether the market economy is capable of handling that - i.e. it is politically possible to incorporate that.

As part of my Ph.D. I made a case study on Hinaya, an *obi* and

Shin Takamatsu: *Origin III,* third phase of the new headquarters building for the textile company Hinaya was completed in 1986.



kimono company in Kyoto's textile district, Nishijin. Today, kimono and obi are far from daily dress mode of modern Japan. But in a time where the whole silk industry is in deep crisis, Hinaya has been able to expand and to establish a situation of creative development without renouncing on ultimate demands on product quality. In order to open up the business to contemporary society, Hinaya in 1981 had the young architect Shin Takamatsu designing a new headquarters building, and within a year from the completion, the company had doubled its turnover. Hinaya has established a totally new distribution system, with a high degree of direct selling and without the in-between *tonya* wholesale houses loading the silk production with heavy profits. And today Hinaya has established own shops in Tokyo and New York. So one strategy of having productions dependent of large amounts of manual labour surviving the economical conditions of industrial economy is cutting away all in-between links and rely solely on direct connection between producer and customer.

With the emergence of the internet direct selling and network marketing will enter a new era. In the near future remarkable changes in the present distribution systems are most likely. Skin care products are now occupying some of the most expensive downtown shop areas. But as customers realise that they pay more for the wrapping than the products - for instance the raw material share of the final price for skin care products are typically 3% or lower - they might turn to network marketing distributed products, where raw materials might count for 18-25% of the total price. And who knows - maybe the present Disneyfied commercialised downtown reality will be replaced with cities where we again live and meet for cultural reasons.

The Swedish car company Volvo some years ago tried out new strategies to break down the boring work patterns of work along the assembly line, letting each employee follow the cars throughout the assembly process. But this attempt to create a work situation responding and appealing to modern expectations of work life showed up to be non-competitive, and eventually was given up.

Volvo envisioned a new mode of ownership as well. In the future you would not buy a car, but lease it, and the company would then be responsible for the continued maintenance, check-up and improvement. Volvo cars are reputed to last long time, and according to the vision, the company after leasing period would be responsible for taking back the car, reusing all possible parts, and recycling the remains.

Lebbeus Woods, axionometric drawing of *Ideal City* (1985). Woods through his architecture searches for a contemporary understanding of our world-view.

If generally applied, such principle would denote a total change of design and production. Already at the drawing table we would naturally visualise the maintenance, decay and cleaning up process of our design, not only in economical terms, but with a full understanding of the environmental implications. Due to the load of the recycling expenses a throwaway plastic cup would suddenly be as expensive as a handmade. And a lot of unsustainable items that are today widely used and thrown away because of the failure of the market to internalise environmental expenses, would totally disappear or be drastically reduced in use.

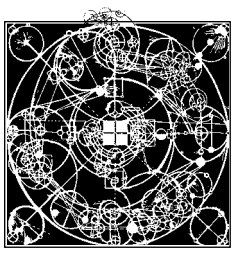
The underlying paradigm

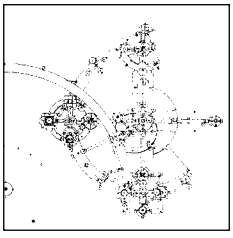
A paradigm is a pattern of values. All science and research presupposes a world-view, a collection of fundamental objects, natural laws and definitions. It may not be as manifest or precise in definition, but the human realm at large is structured on a similar underlying pattern of values - a paradigm unifying a given epoch and culture.

We can detect paradigms far back in history, but the notion of paradigms was only established in 1962 in Thomas Kuhn's (1922-96) book: *The Structure of Scientific Revolutions.* Encyclopædia Britannica states that: "Thomas Kuhn changed the view of scientific progress totally. Where once the history of science was

From Lebbeus Woods: *The Ideal City.* All parts fit each other in this fully controlled and predictable clockwork universe - architecture reflecting and depicting the natural laws.

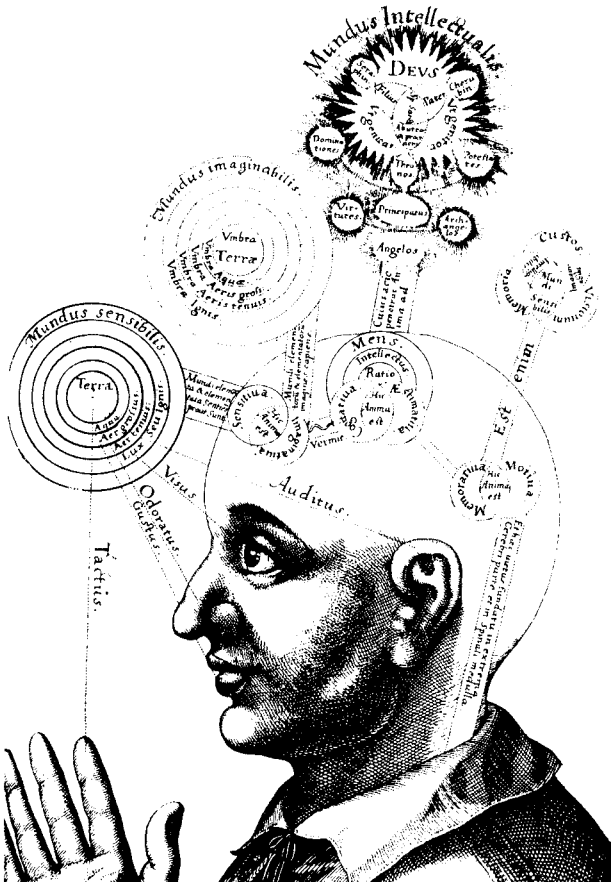
To the left the principal plan, to the right two zooms into this built universe.





seen as a steady progression where theory is added to theory until the truth is found, Kuhn saw a series of revolutionary changes of the world-view of science, where the view of one period had very little in common with the previous. Most importantly, he questioned the possibility for science ever to find a truth."

For a long time in history, the theology of the religious institutions was central to the ruling paradigm - Man basically understood himself and his realm in relation to the realm of God - or the spiritual realm. But from the Age of Enlightenment, this frame of reference was questioned. And with the discoveries of Copernicus (1473-1543), Galileo (1564-1642), Kepler (1571-1630), and Newton (1642-1727), a foundation for a new world-view based on a scientific (and secular) understanding of the world was established. This essentially mathematical paradigm is often referred to as the Cartesian paradigm after the philosopher René Descartes (1596-1650). It saw the world in terms of a fully predictable clockwork-like pattern of cause and effect, and all objects was supposed to be involved in - and understood through - that type of mechanistic interaction.



The structure of the spiritual brain, according to the alchemist and medical doctor Robert Fludd (1574-1637).

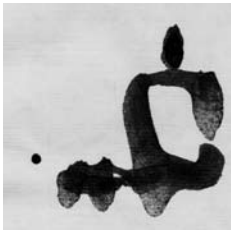
Central to method of the Cartesian paradigm was an understanding of the necessity to cut free and isolate the investigated phenomena from the surroundings in order to uncover the ideal natural laws. Thus the Cartesian paradigm is often referred to as reductionist in nature. This approach was gradually applied also the humanities, and an understanding of human beings and our environment according to the mechanistic models developed, in which it was a deed to isolate phenomena of the living world from its complex relationship with the surroundings. The human body, the human nature, our illnesses and cures etc. were understood against the mechanistic logic.

Already Goethe (1749-1832) established a fierce criticism that the mechanistic perception of the Cartesian perspective was almost randomly applied outside its field validity. If we wanted to understand life, we had to derive the understanding from the living world, not from physical rules of dead matter, Goethe insisted. The attitude aspect of our present environmental crisis can to a large extent be understood as mis-extrapolation of realm of the dead bodies' physics deep into the realm of the living nature as well as our whole mode of thinking and analysing.

In the wake of Einstein's theory of relativity and the quantum physics, a whole series of new discoveries and perceptions throughout the 20th century has radically questioned and changed the Cartesian paradigm. Hard science today operates within a totally new paradigm, and we are in a time of transition. Also biology is establishing fundamentally new modes of understanding, free from the simplicity of the reductionistic paradigm of the classic physics. And whereas the emergence of industrial society had physics as the core understanding, our next scenario might very well see a new biology - or rather our understanding of life - taking over the role as the foundation of science.

Whereas a mechanistic world-view leads to *shallow ecology* perceptions, modern systems biology makes way for a *deep ecology,* which provides us an efficient framework for understanding the complex dynamics of the biosphere and seeing human beings and our activities in a much more fruitful way. The systemic approach, as well as the new paradigm at large, is still in its formative phase, but it appears to provide us powerful tools for re-establishing a more sustainable future.

A *deep ecology* takes its starting point outside human beings. It understands human beings as an integral part of the living



http://www.britannica.co.uk/

world rather than something ruling the world - or having the right to ruling the world. It recognises the equal right of all living entities to be.

The systemic approach

Like the homeostasis model, the systemic model originates from modern biology. Systemic thinking is process thinking, a dynamic approach, which considers for instance a house, a city or a company as a living system, which is connected to other living systems in a non-linear way. Living systems build a kind of a systems tree, a hierarchic organisation of life levels, in which each system makes part of larger systems and is composed by a series of sub-systems; not as expression of power, but as an organising principle.

Thus, architecture understood as physical or aesthetic form is not a system, but makes *part of* a system, which includes the life processes that the piece of architecture in question is involved with. With a reference to systemic biology, architecture can be understood as the cell membrane, which structures the life of the cell and defines its appearance, but even then it is only *a part of* the living cell. Architecture as understood in systemic terms involves as well the life processes it structures and its exchange with the surroundings.

Fig. 4, based on the chapter: "The Systems View of Life" in Frijof Capra's book, *The Turning Point,* 1982, pp. 285 ff. illustrates the basic set-up of the systemic understanding. Adapting this model to our design process and understanding of our designs is an outmost powerful tool for understanding how our design structures life. For architectural design, the primary system to investigate will be the actual architectural system. But it makes very much sense to investigate as well larger systems and sub-systems within. For product design it might generally make most sense to investigate the actual object as part of larger systems, for instance seeing a transportation system as circulatory system in the city rather than a system itself.

A living system is open for description through plural parallel modes of description in order to uncover the inner dynamics, the flux, and the exchange with the surroundings of the system. A living system is characterised by self-organising from within. The system is striving for equilibrium, but is always far from equilibrium. This striving for reintegration on still higher levels is the generator of the system.

The stability of the system is adjusted and refined through continued adjustments. In his outline for a systemic framework of understanding Frijof Capra further discusses a whole series of qualitatively different ways of adaptation and transformation for living systems, from metal adaptations, to genotype changes, regeneration, self-transformation and transcendence.

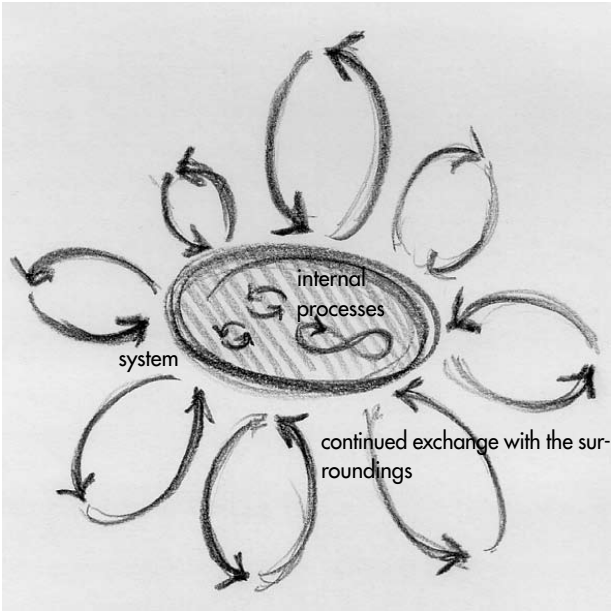


Fig. 4: Sketch of a systemic model based on the systemic framework outlined in Frijof Capra: *The Turning Point,* 1982, pp. 285 ff.

Whereas Darwinism focused one-sidedly on the self-asserting properties of the systems - as in the statement: "Survival of the Fittest" - the full systemic approach involves a whole series of complementary harmonising principles, like integration, relation, and symbiosis. Symbiosis describes the mutually interdependent coexistence between members of two different species the eco systems. In a very broad sense any association between two species populations that live together is symbiotic, whether the species benefit, harm, or have no effect on one another. Sometimes if the relation looks one-sided, we call the exploiter for a parasite. In this perspective, human beings can easily be seen as a bigger parasite on earth.

The dynamics of a living system is clearly demonstrated in the natural succession (see fig. 5). Succession is an evolutionary progression from the simple to the complex, and through time bio-systems of practically any site change towards mature systems. After fires or after ploughing, where the bio-system is forced back to start, patterns of faunal succession can be detected in

In *The Turning Point* (pp. 317 & 316) Capra states that in systemic perspective: „individual human minds are embedded in the larger minds of social and ecological systems, and these are integrated into the planetary mental system - the mind of Gaia - which in turn must participate in some kind of universal or cosmic mind. ..... In the word of Jantsch, 'God is not the creator, but the mind of the universe.' "

„If we separate mental phenomena from the larger systems in which they are immanent and confine them to human individuals, we will see the environment see the environment as mindless and tend to exploit it. Our attitudes will be very different when we realize that the environment is not only alive but also mindful, as us."

case the area is given free to its own dynamics. Firstly, a variety of flowers and herbs with a one or two-year cycle dominate, but after a while a dense carpet of grasses takes over the scene. Then scattered bushes and trees will emerge, and after some years a young forest dominated by one or a few species of trees will take over the scene. From that stage gradually a mature eco-system develops exhibiting a very high bio-diversity and a still more complex symbiotic pattern of interaction or interdependence between the many species of animals and plants. Thus, due to the homeostasis, the stability of the system is much stronger.

Understanding how manmade productive and aesthetisised landscapes correspond to the stages of succession may give important hints for outlining a sustainable scenario. Now major parts of our agricultural production are taking place in very young eco systems. The more we can employ mature systems for our needs, the more complex nature we allow, and the less are we for instance dependent on chemical means of fighting insects etc. Forestry as well as agriculture could easily develop more appropriate methods of employing mature systems. And nature does not stop at the city border. Our cities could actually be re-developed into rich and variegated mature eco systems. It would be a blessing for human beings as well as for a wealth of life.

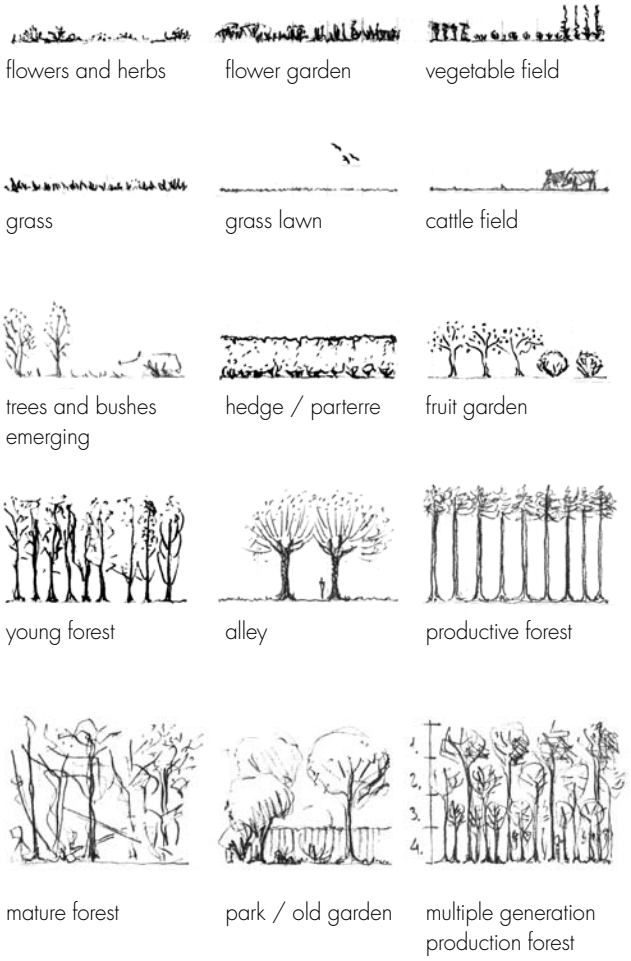


Fig. 5. Natural succession and the related plagio-cultural landscapes. In the left column from top to bottom a series of stages of the natural succession is illustrated. In the middle column are illustrated some corresponding aesthetisised landscapes, and in the right column you find the corresponding productive landscapes.

Generally the complexity and bio-diversity of these biotopes is increasing towards the bottom.

Examples of systemic approach

As a result of the Rio Conference, June 1992, having participants from governments and non-governmental organisations from all over the world, an *Agenda 21* was set up for directing the world society towards a more sustainable situation. For implementation of this agenda, a whole series of Local Agenda 21 initiatives was initiated all over the world. *The European Sustainable Cities and Towns Campaign* for instance was launched at the end of the European Conference on Sustainable Cities and Towns, which took place in Aalborg, Denmark, May 1994.

By now 120 cities from all over Europe have signed the related *Charter of European Cities and Towns Towards Sustainability* and work under these guidelines. The charter does not use the specific systemic terms, but the whole charter text is strongly structured on the systemic approach. The objective of this campaign is to promote development towards sustainability at the local level by strengthening partnership among all actors in the local community as well as inter-authority co-operation.

In the consensus declaration I.1 it is stated that: „We understand that our present urban lifestyle, in particular our patterns of division of labour and functions, land-use, transport, industrial production, agriculture, consumption, and leisure activities, and hence our standard of living, make us essentially responsible for many environmental problems humankind is facing. ..... We have learnt that present levels of resource consumption in the industrialised countries cannot be achieved by all people currently living, much less by future generations, without destroying the natural capital.

"We are convinced that sustainable human life on this globe cannot be achieved without sustainable local communities. Local government is close to where environmental problems are perceived and closest to the citizens and shares responsibility with governments at all levels for the well-being of humankind and nature. Therefore, cities and towns are key players in the process of changing lifestyles, production, consumption and spatial patterns."

In response to the nature of the ecological problematic a multiple

Turning our big cities less unsustainable in near future is urgently necessary. Here Tokyo's new town hall (1991), designed by Kenzo Tange, is on the way to Heaven.

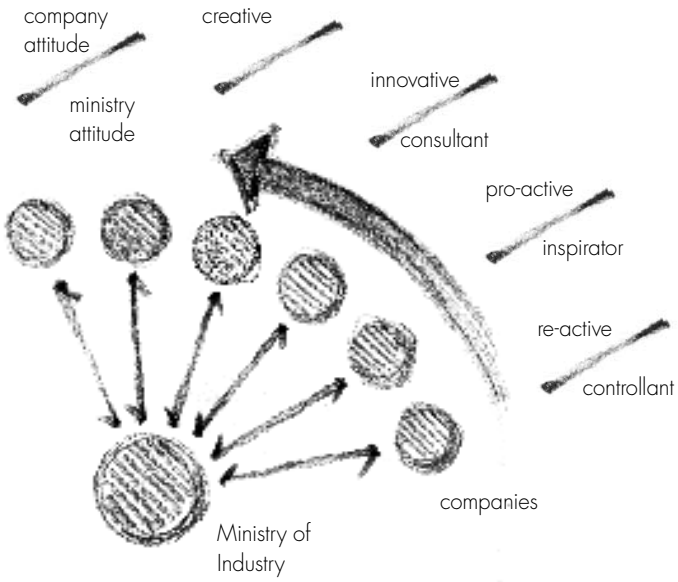


Fig. 6: Modes of interaction between companies and the Danish Ministry of Industry regarding implementation of ecological improvements.

level strategy has crystallised. Thus parallel to the situation that the European Union has developed to be the natural forum for most general political decisions on ecology and sustainability - the national scope is simply too limited - a strong emphasis on the work in the local communities has developed.

Further in I.2 it is stated that: "We, cities & towns, understand that the idea of sustainable development helps us to base our standard of living on the carrying capacity of nature. ..... Environmental sustainability means maintaining the natural capital. It demands from us that the rate at which we consume renewable material, water and energy resources does not exceed the rate at which the natural systems can replenish them, and that the rate at which we consume non-renewable resources does not exceed the rate at which sustainable renewable resources are replaced. ..... Furthermore, environmental sustainability entails the maintenance of biodiversity; human health; as well as air, water, and soil qualities at standards sufficient to sustain human life and wellbeing, as well as animal and plant life, for all time." Sharing this mode of understanding among all actors in the political system - citizens, local and national authorities, non-governmental and international institutions is crucial to future development.

Some years ago I attended a two-week workshop on sustainable economy at Roskilde University for researchers from a wide spectre of fields. One keynote speaker of the workshop was from the Danish Ministry of Industry. And it turned out that in the implementation of a whole package of environmental regulations, including CO_2 taxes and a variety of other environmental initiatives, the ministry employed a systemic understanding as the basis of the communication (or in systemic terms the exchange) between the ministry and the companies (see fig. 6).

The typical Danish company is small to medium size and cannot simply establish a well-functioning environmental department overnight, why the understanding of such interference with a formerly established free right to produce whatever you want in whatever way you want easily is met with resistance.

The ministry realised that the company attitudes towards such ecologically founded intervention were most different. This reflects both differences in understanding of the importance or necessity of making changes towards better work environment and more sustainable productions, and the fact that for some companies it is perceived as weakening of their competitive potential, whereas actually for several companies it has turned out to be a positive competitive parameter. Thus the ministry established an understanding of the different modes of perception and reaction - from re-active to pro-active and innovative - and acknowledged it to be an important asset in a short time perspective to be able

The European Sustainable Cities and Towns Campaign:
http://www.iclei.org/europe/suscam.htm
The Sustainable Cities and Towns charter text:
http://www.iclei.org/europe/echarter.htm
The European Academy of the Urban Environment:
http://www.eaue.de/default.htm
Example, plan for sustainability for the city of Aalborg:
http://www.eaue.de/winuwd/108.htm

to meet the companies exactly where they were.

In a larger perspective the ministry works actively at developing more sustainable attitudes in the individual companies and among its employees. Inside every company a strong firsthand knowledge on the processes underlying the production is present. Bringing this firsthand insight of the companies and individuals within the companies into a creative interplay with the general expertise of the ministry provides a most fruitful basis for the actual design of the ecological improvements.

Whereas the re-active company seek the smallest possible change in response to the changing demands and thus calls for the authority as controllant, the more environmentally conscious pro-active company works together with the ministry and its expertise to find the best possible solutions within the new framework of conditions. Through its overall activity mode, the ministry encourages the development within the companies of a directly innovative response, which brings about the optimal solutions for the specific situations and ensures the individual company a high degree of freedom regarding the specific way it attains its ecological improvements.

The mature company has recognised its central role for developing a sustainable future and acknowledged its cultural responsibility. In systemic terms, the mature company has fully developed its self-structuring capacity and has totally internalised its structuring or formative power. Such company hardly needs a ministry. Through its responsibility and creative response to the situation, it has regained its freedom on a higher level.

Oticon is a Danish company producing hearing aid devices - and recently a very successful one. The company has an outspoken systemic understanding not only of its product development but of the whole company structure. And the company has developed hearing aid devices with a design that addresses the social interplay situation and has the capacity of continually adapting to both the device bearer and the acoustic environment.

Realising that the present work facilities for Oticon's 140 person research & development department kept the innovative process in a negative circle, in 1991 led the company to move to new facilities that supported a "spaghetti" organisation, in which a whole series of addressed structuring elements effortlessly could change with the changing nature of the work processes.

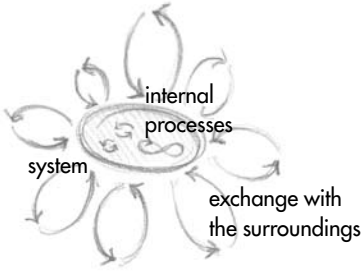
Simultaneously the corporate structure was undergoing a radical transformation. A highly advanced network of workstations was established to ensure a paper-free work environment. The old hierarchy was totally removed and everybody was treated as self-dependent and self-structuring mature individuals - it was an important asset to have the creativity as understood in a broad sense liberated. Work hours were given up - there was a work to be done, not work hours to be kept. In case you feel for it, take a day off. In case your child is ill, stay at home and care for it. As Lars Kolind, president of Oticon states, "Nobody can persist confidence." He saw his job as establishing a work situation so exciting that people were strongly motivated for coming there.

Oticon is a lighting example of a possible work scenario in which patterns from the early age of the machines finally are replaced with a set of values corresponding a contemporary human life. But regrettably the architects and interior designers for the new facilities were only able to meet the visionary client on a very shallow level. We still have much to learn regarding how architecture corresponds and structures life and work processes - but here the systemic approach will prove to be a valuable tool.

During my study time at the Royal Academy (1980-87) I was member of a study group that defined its studies as architectural design work in ecological context. The orientation was definitely holistic - we tried to break away from the narrow boxes of understanding, which seemingly prohibited ecological understanding and initiatives to develop. Thus we were investigating not only resource and energy aspects of design, building and planning, but tried to handle also consciousness and attitude aspects, cultural ecology, and health problematic on multiple levels as integral parts of the ecological problematic. In a continued study circle parallel to our project works we read and discussed writings of Lovelock, Bateson, Capra and a row of other writers trying to attain a firm understanding of the paradigm approach and to establish a well defined holistic or systemic platform for understanding architecture.

To me, the meeting with Capra's *The Turning Point* in 1982 became a definite before and after. Even though there was no single word on architecture in it and his outline of the systemic framework of understanding gets a little loose when he approaches culture in terms we normally apply cultural phenomena, I had an immediate strong intuitive insight that this was a most powerful tool for understanding. And ever since, the systemic approach has been integral part of my luggage as practising architect, architectural researcher and human being.

Already in "Health as Dynamic Balance," an entry for the competition *Health and Housing,* we tried out the combination



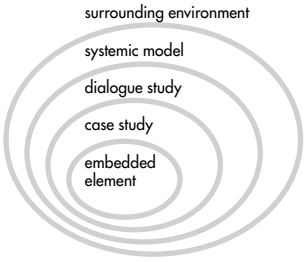


Fig. 7: Diagram showing the frame of understanding in my Ph.D. dissertation *Arbejdets Rum* [Spaces at Work], Kunstakademiets Arkitektskole, Copenhagen 1999.

A scene from an annual ceremony for worn-out brushes at Shogaku-an, subtemple at the Zen temple Tofuku-ji, Kyoto. In the Japanese tradition there are many examples of sustainable consciousness and life patterns. The formative phase of the *wabi* tea aesthetics for instance represents a highly refined aesthetisising of a mode of materials and building technology of the *minka* that so to say grows out of the soil.

of scenario method, TAO homeostasis model and paradigm analysis - and got a 3rd price. Half year later, I made an entry for the competition *Youth and Housing.* Through a consequent systemic approach developed on basis of the systemic outline in *The Turning Point,* this entry was able to convincingly handle qualitative aspects of the problematic and was awarded a 1st price.

With my recently finished Ph.D. project, *Arbejdets Rum* [Spaces at Work], 1999, I got a chance to develop the systemic framework of understanding into a firmly established methodological approach to architecture (see fig. 7). And from this five-year process it has become even more evident to me that the systemic approach offers a powerful perspectivising tool for our understanding of how architectural structures work with the life processes and how we can establish structures for the future in which the human realm are reintegrated in the surrounding nature in a more healthy, more sustainable and more beautiful way.

Also my next research project - an investigation into the capacity of architecture to support the healing process - will be strongly rooted in a systemic understanding of the life of hospital, staff and patients, man and health. This research project has roots in an interest in the capacity of architecture when it comes to healing processes that are dating back to my study years.
This investigation has two main parts. The first part is a paradigm-based analysis of the hospital culture through the times, all the way to our modern hospitals. In this perspective the architecture and structure of the modern "hospital machine" is a very direct expression of the mechanistic paradigm. This paradigm is fundamentally alien to life processes, and many of the problems of modern hospital culture are rooted in this.

The second part of the project is an analysis of contemporary examples that are exploring new paradigmatic trends. On this double background it is my hope to be able to outline important principles for future development of the healing environment.

I sometimes state that I have no interest in architecture as reduced to aesthetic form, only in the relationship between life and form - including architectural form.

The Danish poet, priest and politician, N.F.S. Grundtvig (1783-1872), talked vividly about *the living word*, thereby raising a quest for teachers to shape their knowledge according to the actual situation and make it vital to the listener - and not only rely on lecturing dead phrases. Could we in our architecture, design and research develop a corresponding *living form,* which originates from life, promotes and supports life processes in a living way? What is a *living form,* and how do we as architects, designers and researchers develop methods and attitudes, which are formed by life - and not the other way round?

This essay is written far from my bookshelf, so even though the background literature for this text is very comprehensive, please forgive me that references are utterly sparse.

Frijof Capra: *The Turning Point. Science, Society, and the Rising Culture,* Wildwood House, London 1982.
Jesper Hoffmeyer: *Økologiske produktivkræfter,* Forlaget Klodshans, Copenhagen 1977.