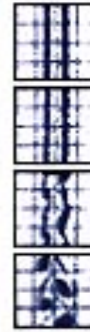


Team of authors

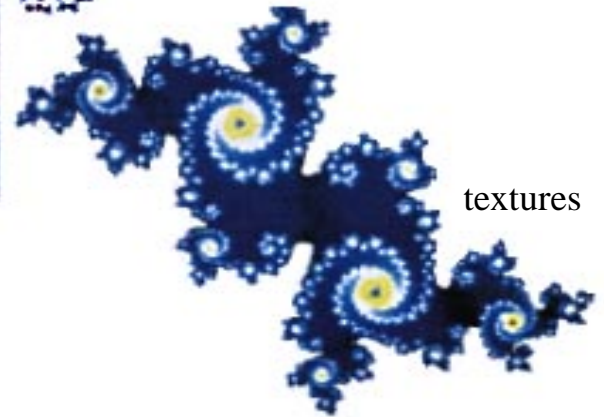
Images of Water

structures



Discovering and Inventing realities

forms



textures

gestalten



artefacts



concrete utopias

Interdisciplinary system - education through interdisciplinary system formation

Vorbemerkung:

Dialog- und Gestaltungsfähigkeit als Bildungsziele in einer sich verwissenschaftlichenden Gesellschaft

Die hier vorgestellten Materialien wenden sich an alle, die an interdisziplinären Arbeitszusammenhängen interessiert sind: an Lehrende in Bildungseinrichtungen, Mitglieder in politischen Gruppierungen (Parteien, Berufsverbände, Bürgerinitiativen, soziokulturelle Netzwerke o.ä.) an Wissenschaft interessierte Laien oder an Berufstätige, die in komplexen Arbeitszusammenhängen tätig sind. Es sollen Orientierungen angeboten werden für den Umgang mit offenem und komplexem Wissen, für die Entschlüsselung komplexer Entwicklungen, für die Vertiefung auch in fremde Spezialisierungen bei gleichzeitiger bereichsübergreifender Integration (Kooperations- und Teamfähigkeit), für die Teilnahme an langfristigen Arbeitsprozessen, für Identitätsfindungen in komplexen Kontexten, für die Ausbildung von Wissen über Wissen und für die kreative Gestaltung möglicher Zukünfte („konkrete Utopien“).

Die Anlage der Materialien orientiert sich an der Entwicklung menschlichen Wissens sowohl in historischer wie systematischer Sicht. Entfaltet werden sechs Tätigkeitsfelder, die von der alltäglichen Lebenswelt über Kunst und Naturwissenschaft aufsteigen zu den Formalwissenschaften, um dann über die Technologie wieder zur gesellschaftlichen Praxis zurückzukehren. Dadurch entsteht eine *Interdisziplinarität*, in der verschiedenartiges Wissen nicht nur additiv aneinandergereiht, sondern schrittweise entwickelt wird und immer aufeinander bezogen bleibt. Gleichzeitig wird ein Nachdenken über die Entstehung und Entwicklung von Wissen und damit *Transdisziplinarität* angeregt, verstanden als ***Erzeugung von Wissen über Wissen*** in einem Dialog von Wissenschaft und Gesellschaft.

Genutzt werden können die Materialien zum Selbststudium wie auch als Einführungs- und Begleitmaterial für Projekte in verschiedenen Praxisfeldern.

Noch nicht übersetzt. Oder soll diese Seite in der englischen Version nicht erscheinen?

Um die Zielrichtung der Materialentwicklung deutlich werden zu lassen, werden im folgenden einige Bildungsziele benannt, die als grundlegend angesehen werden können für den Umgang mit Wissen in einer sich verwissenschaftlichenden Gesellschaft:

- o Erkennen, daß Gegenstände/Objekte nicht mehr einfach gegeben sind, sondern auf theoriegeleiteten Konstruktionen beruhen und vielfältige Metamorphosen durchlaufen.
- o Erkennen, daß unmittelbare Anschauung nicht mehr das zentrale Mittel menschlicher Tätigkeit ist, sondern Unanschaulichkeit und Anschaulichkeit in einem komplementären Verhältnis zueinander stehen.
- o Erkennen, daß Demokratie und Wissenschaft nur über inter- und transdisziplinäre Dialoge miteinander vereinbar sind: „Jeder Mensch ein Wissenschaftler“ (G.A. KELLY) / „Jeder Wissenschaftler ein Mensch“ (A. RAEITHEL).
- o Erkennen, daß Wissen heute komplex, dynamisch und offen ist und in einem vorher nicht bekanntem Maße in einem Spannungsfeld von Wissen und Nicht-Wissen steht.
- o Erkennen, daß die Gestaltung der Welt durch die Menschen in einem Spannungsfeld von Erhaltung und Gestaltung steht (Bewußtheit über die Notwendigkeit von „Sustainable Development“).



Contents

- 1. Images of water - Integrating science, art, technology and everyday life**
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 - 2.1 The basic problem: the relationship of humanity and nature**
 - 2.2 Six fields of activity and first examples for possible activities**
 - 2.3 Concept of an educational program - Further differentiation of six activity fields**
 - 2.4 The six activity fields briefly summarised**

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structures

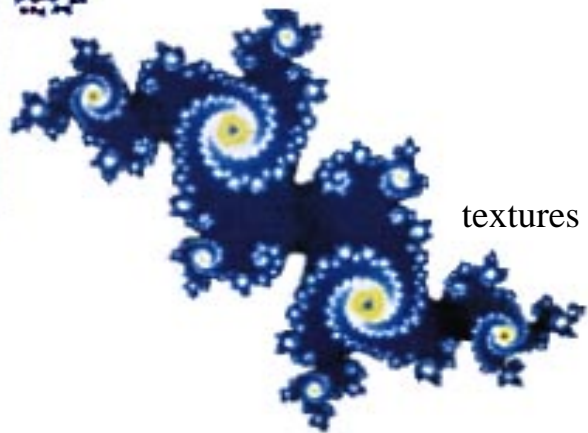


Discovering and Inventing realities

forms



gestalt



textures



artefacts



concrete utopias

1. Introduction

Images of water - Integrating science, art, technology and everyday life

Problems of modern societies are complex problems. Since they have not been caused by the use of science, art and technology, the suggestion can be made to look for interdisciplinary solutions which follow from the interaction of these three fields. In equal manner, a democratic participation of all three in the solutions is to be striven for because this is the only way to attain a wealth of ideas and the approval of all involved.

Water is an object on which the co-operation of science, art, technology and everyday life can be practised in an exemplary manner. It is a fascinating natural phenomena, full of dynamics and complexity and an indispensable foundation for life.

Images of water are an important means for people in order to discover given reality such as well as being a way to invent possible realities. Images are both reproductions as well as fantasies, representations and reproductions such as constructions and drafts of possible futures.

The production of images is divided into six fields of activity. Since entireties are always presented with images, one speaks therefore of *systems* here, in order to have a common denominator for all areas.

The following sequential steps are differentiated:

1. **Intuitive systems:** gestalten
2. **Artistic systems:** forms
3. **Scientific systems:** structures
4. **Formal-abstract systems:** textures
5. **Technological systems:** artefacts
6. **Ecological systems:** concrete utopias

Alltogether, this is a passage through different disciplines, which remain related to each other, a logic of development is fundamental here which is based on the relationship of tension between contents and form. By separating form and contents, a level of high abstraction is reached as a result of constantly stronger concentration on the formal level, which gives access to a world of the possible. What causes a problem however is how to combine reality and possibility in concrete utopias together in a productive interaction with each other. Knowledge concerning the different kinds of images can become an important means of conscious human activity by these drafts for possible futures.

2. The step by step development of complexity of the educational concept

2.1.

The basic problem

The relationship of humanity and nature

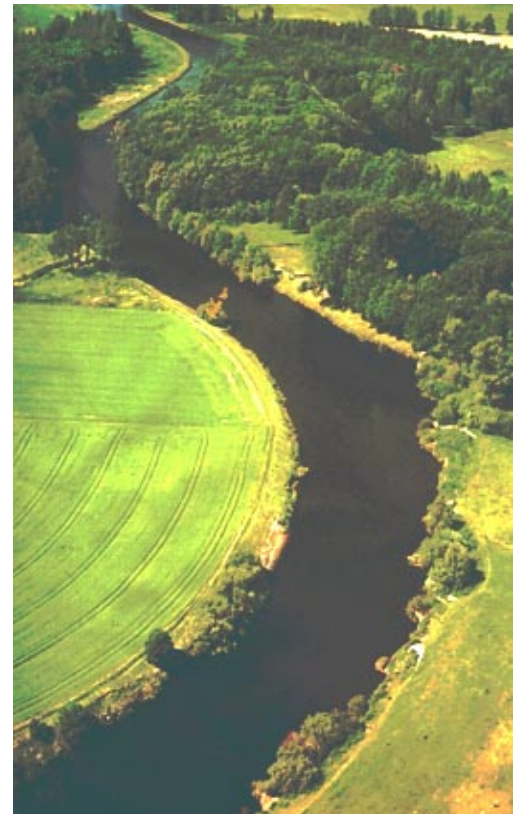


The basic problem:

Which type of a relationship should exist between nature and humanity?



Students tend to force water in a strict simple order when building a table fountain. They express their experiences of civilisation graphically. In everyday life they are mainly confronted with water in a canalised form, hardly ever in the complexity of its natural movements.



Water in the complexity of its natural movements with a multitude of whirls and turbulence as Leonardo da Vinci illustrated water in his drawings.

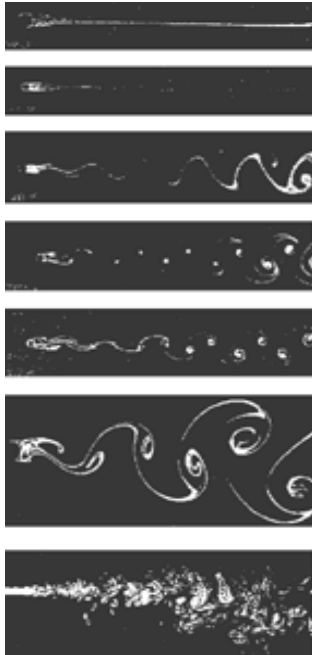
“*The flow is the sensitive chaos*“ (Novalis). The experience people have with water is briefly expressed here. Fundamentally, tension exists between order and chaos as well as between influenciability and independent influence. How should a person behave towards these fields of tension? The philosopher Ernst Bloch mentions three historic successive possibilities:

- In the phase of natural force the natural elements dominate.
- In today’s phase of control over nature, humans dominate with the help of science and technology over nature but they also increasingly destroy it.
- In future a phase of alliance with nature, a partnership between humanity and nature has to be striven for.

Eine Schlüsselerfahrung:

Ein Bildungsexperiment mit einer "Wirbelstraße"

noch nicht übersetzt



Flüssigkeitsbewegungen vollziehen sich in einem Spannungsfeld von Ordnung in Form laminarer Strömungen bis hin zum Chaos von Verwirbelungen und Turbulenzen. Die "Wirbelstraße", in ihrer Idealform bekannt als KARMANNsche Wirbelstraße (benannt nach dem Strömungsforscher KARMANN), stellt eine Grenzphänomen insofern dar, als sie zwar komplex, aber noch im Experiment reproduzierbar ist und damit sich im Übergangsbereich von Ordnung zum Chaos bewegt.

Wenn man in ein mit Flüssigkeit gefülltes Becken einige Tropfen Ölfarbe hineingibt und in langsamer Bewegung einen Stab durch die Flüssigkeit hindurchführt, entstehen Verwirbelungen, die sich unter bestimmten Umständen zu einer Wirbelstraße gruppieren (mathematisch darstellbar mit der sogenannten REYNOLDS-Zahl).

Man erfährt dabei zweierlei:

- o Zum einen ist das Flüssige durch den Menschen bestimmbar, zum anderen wird der Mensch aber auch immer in seinem Kontakt mit dem Flüssigen durch dieses bestimmt.
- o Gleichzeitig kann man beobachten, daß das Flüssige sich in einem Spannungsfeld von Ordnung und Chaos bewegt.

Problemstellung:

Wie soll der Mensch sich im Umgang mit Flüssigem - oder allgemeiner: mit Natur in dem Spannungsfeld von Ordnung und Chaos einerseits und Bestimmen / Bestimmtwerden verhalten?

2.2

Six fields of activity and first examples for possible activities

I

Intuitive systems:
Gestalten

II

Artistic systems:
Forms

III

Scientific systems:
Structures

IV

Formal-abstract systems:
Textures

V

Technological systems:
Artefacts

VI

Ecological systems:
Concrete utopias

I Intuitive systems:

Gestalten

*Experience the magic of water,
grasping it with all your senses*



In the sensual-concrete contact with water, people experience the change between order and chaos, from the influencing and being influenced in the interplay of phenomena.

In this field of activity, water is observed in nature, it is played with, intuitive experiences are gained and are expressed vividly in the form of fountains and fantasy landscapes.



One can totally concentrate on water when playing with it as well as experiencing the interplay of order and chaos and being influenced by it.



One can also control, lead and guide water. While doing this, the interplay between influencing and being influenced can be experienced.



II

Artistic systems:

Forms

*Separation of contents and form,
combining forms with new
contents*

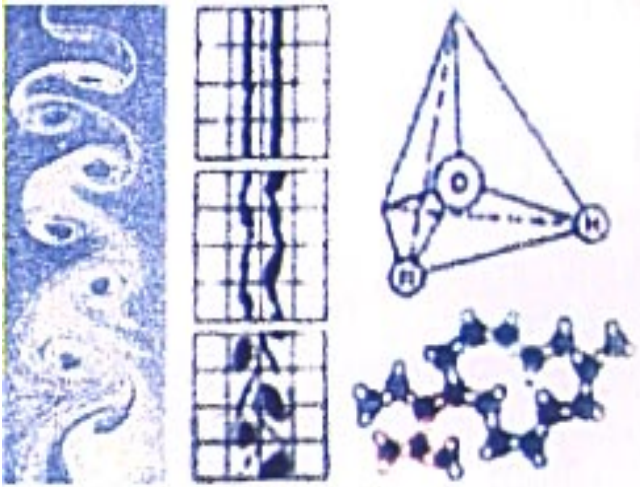


If you separate the form from the contents, then they can be studied in their peculiarities but also by using analogies you can combine it with new contents. In this field of activity, forms of water become independent, their contours are pursued and developments from the straight line to the chaotic maze of lines can be pursued. The analysis of works of art shows that forms of water are used in order to express perspectives of the world in an aesthetic form.



▲ Spirals, a basic form of water can be developed from the straight line.

▶ In medieval works of art, the form of calm water is used as a way to show that God created the world as a harmonious order.



III

Scientific systems:

Structures

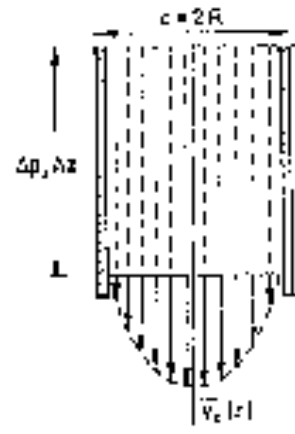
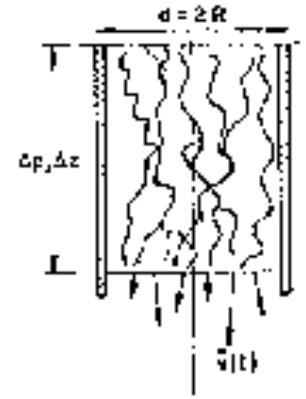
Introduction to the concept of particles in order to examine elements and their relationships

Now the concept of particles is to be introduced: Water is regarded as being composed of elements. Existing and possible relationships between basic components are sought after which are illustrated in structures, by which the particles appear as dots and the relationships as lines.

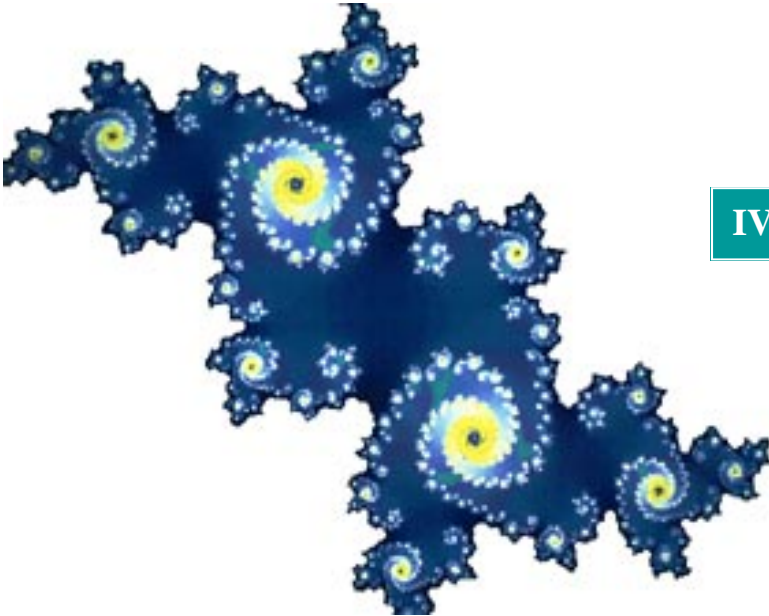
The image of particles can be used from anything from a visible particle to a “elements per volume“ which are only mental constructions. The concrete contents of water which are grasped by the senses become lost as a result. However, what is gained with these formal abstractions is the advance towards the possible.



Das Strömungsbild

laminar: $Re \leq Re_{krit}$ turbulent: $Re \geq Re_{krit}$ 

The source of forms of water movement can be examined when particles (tracks of seed, graphite particles, dried herbs etc.) are strewn into the water. If nothing comes in between them, then they remain as neighbours in their tracks. A disturbance gives them reason to break away and go their own way. What results then is chaotic whirls and turbulence.



IV

Formal - abstract systems:

Textures

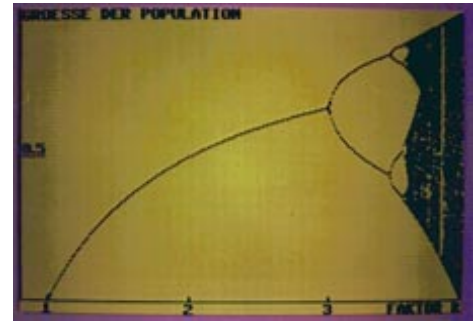
Free combinations of elements by releasing them from the representation of certain contents

Fluid particles are represented in images by scientists by means of dotted elements. If one frees the elements from this function and let them only have their own significance, then the relationships between them are not narrowly determined by certain contents. They can now be freely distributed, newly organised and previously unknown patterns up to now can be discovered and invented. In this manner, textures take the place of structures.

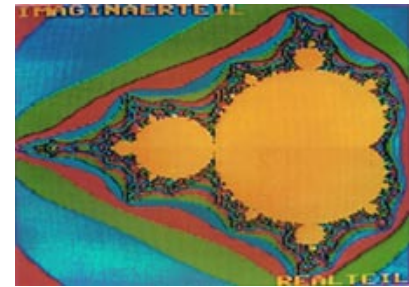
With the iteration equation $x^2 + c = y$ generated sequences of numbers

Abstract Mathematics which is made visible in computer graphics

Polynomiteration f(x)=x^2+0		Polynomiteration f(x)=x^2+0		Polynomiteration f(x)=x^2+c	
Startwert s0=0.5, Konstante c=0		Startwert s0=0.5, Konstante c=-1		Startwert s0=0.5, Konstante c=-2	
1	5.000000000E-01	1	5.000000000E-01	1	5.000000000E-01
2	2.500000000E-01	2	-7.500000000E-01	2	-1.750000000E+00
3	6.250000000E-02	3	-4.375000000E-01	3	1.062500000E+00
4	1.562500000E-01	4	-8.085937500E-01	4	-8.710937500E-01
5	3.906250000E-01	5	-3.661761474E-01	5	-1.241195678E+00
6	2.328306436E-01	6	-8.001620749E-01	6	-4.594332671E-01
7	8.4210108674E-02	7	-2.2531472186E-01	7	-1.7889210567E+00
8	2.937358771E-01	8	-9.492332761E-01	8	1.200238396E+00
9	0.000000000E+00	9	-9.8956187518E-02	9	-5.5942744757E-01
10	0.000000000E+00	10	-9.9020767295E-01	10	-1.6870609309E+00
11	0.000000000E+00	11	-1.9688764427E-02	11	8.4610710256E-01
12	0.000000000E+00	12	-9.9962018606E-01	12	-1.7861027710E+00
13	0.000000000E+00	13	-7.5947961886E-04	13	-3.0103007351E-01
14	0.000000000E+00	14	-9.9999942319E-01	14	-1.8767427320E+00
15	0.000000000E+00	15	-1.1535176316E-06	15	1.5221636497E+00
16	0.000000000E+00	16	-1.000000000E+00	16	0.1698162841E-01
17	0.000000000E+00	17	0.000000000E+00	17	-1.8995226471E-02
18	0.000000000E+00	18	-1.000000000E+00	18	1.6081562669E+00
19	0.000000000E+00	19	0.000000000E+00	19	5.8626313367E-01
20	0.000000000E+00	20	-1.000000000E+00	20	-1.6562955318E+00
		21	-1.000000000E+00	21	7.4331491029E-01
		22	0.000000000E+00	22	-1.4476429441E+00
		23	-1.000000000E+00	23	9.5206672582E-02
		24	0.000000000E+00	24	-1.9909356512E+00
		25	-1.000000000E+00	25	1.9438247673E+00
		26	0.000000000E+00	26	1.8266077167E+00
		27	-1.000000000E+00	27	1.4469922138E+00
		28	0.000000000E+00	28	6.3786646819E-02
		29	-1.000000000E+00	29	-1.4912020936E+00
		30	0.000000000E+00	30	1.9643937621E+00
		31	-1.000000000E+00	31	1.8808074977E+00
		32	0.000000000E+00	32	1.6586065435E+00
		33	-1.000000000E+00	33	1.3921205071E-01
		34	0.000000000E+00	34	-1.9806200049E+00
		35	-1.000000000E+00	35	1.9228556016E+00
		36	0.000000000E+00	36	1.8973736737E+00
		37	-1.000000000E+00	37	8.8107733814E-01
		38	0.000000000E+00	38	-1.2237026361E+00
		39	-1.000000000E+00	39	9.0255135337E-01
		40	0.000000000E+00	40	-1.7674616297E+00
		41	-1.000000000E+00	41	1.0535522490E+00
		42	0.000000000E+00	42	-8.9002765851E-01
		43	-1.000000000E+00	43	-1.2073507671E+00
		44	0.000000000E+00	44	-8.4109652453E-01
		45	-1.000000000E+00	45	-1.7072145311E+00
		46	0.000000000E+00	46	9.1458152363E-01
		47	-1.000000000E+00	47	-1.1635606366E+00
		48	0.000000000E+00	48	-9.6417318688E-01
		49	-1.000000000E+00	49	-1.9824602126E+00
		50	0.000000000E+00	50	5.0616032433E-01
		50	-1.000000000E+00		



The Feigenbaum-diagram:: Process description of the way to chaos



The Mandelbrot- amount: illustration of the state of an amount of dots in a field of tension moving from order and chaos

An abstract amount of dots can be produced with the computer by using iteration equations (that means equations that keep feeding themselves with their own results). In the course of this procedure surprises can suddenly occur by start values that lie too closely together (circa 0,5; 1,0; 1,5): In the first case, the respective results strive towards a certain value, which then remains stabile. In the second case they begin after a short time to “oscillate“ between different values. In the third case they never attain a stability, but show chaotic behaviour.

In the FEIGENBAUM - diagram a development of numerical values can be recorded from a lineal order via increasing forking to chaos.

The MANDELBROT - diagram illustrates in contrast to this a certain state, which the numerical values have adopted. Within the figure of the “Apple man“ the numerical values are represented which are to be found in the field of order. The dots outside this figure represent numerical values which have drifted more and more into chaos.



v

Technological systems:

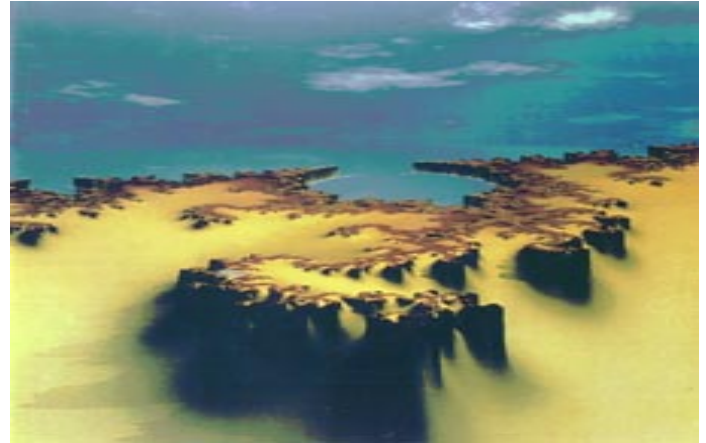
Artefacts

*Generating virtual realities
(artificial worlds) with
technological means*



Abstract amounts of dots only signify themselves first and foremost. They can evoke associations however, such as “That looks like a whirlpool in water!” In technical images fantasies are undertaken in this way, they then become material with which artificial worlds can be invented.

The other way consists of changing images from reality to an abstract amounts of dots by digitalisation. As a result of this clearance of meaning, they also become a neutral material which can be manipulated more or less freely with drawing or animation programs and thus be used for the development of virtual realities.



▲

A design that was produced in a water tank can be played into the computer with the help of a video camera and digitalised. The result is no longer a traditional picture, in which existing realities are depicted but an abstract amount of dots which can be freely manipulated with drawing and animation programs. Material is now at disposal for the drafting of fictive (water) worlds.

▲

An abstract amount of dots, which first of all only stands for itself can be used for the drafting of artificial worlds in which one imagines meanings into them. The amount of almond bread (the "Apple man") can be then seen as a lake. Through embedding in an artificial environment a fantasy product emerges which has been called "Lake Mandelbrot" by the inventors H.O. Peitgen and P.H. Richter.



VI

Ecological Systems:

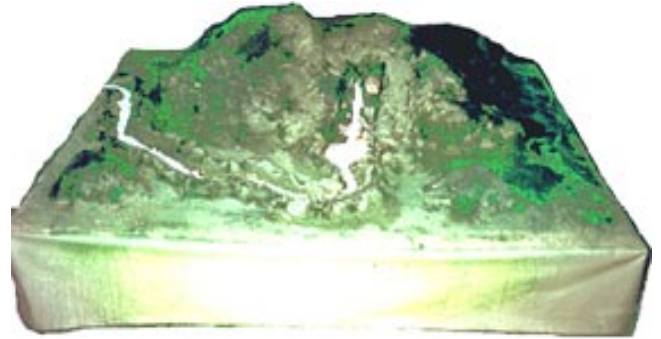
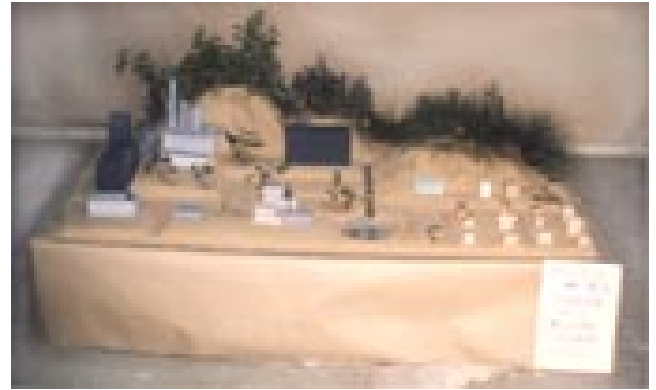
Concrete utopias

*Imparting reality and possibility in
a draft of potential futures*

What type of a relationship should exist between humanity and nature? The way through the activity fields has shown that humanity is turning more towards formal abstractions in order not only to discover existing realities but also to invent potential worlds. Contrast and unity of conservation and formation become a fundamental problem:

How can both sides be arranged with each other so that a partnership between humanity and nature can be made possible?

This problem can be dealt with in the drafting of concrete utopias. Images of water can be used here as a fundamental means. Knowledge on these images enables consciousness and can be a basis for democratic dialogues, in which a natural alliance can be sought for while taking existing possibilities into consideration.



▲
▶

Enriched with ideas, potential futures can be designed. Sensual-concrete, historical and possible images, everything even fantasy is involved. Varieties of a landscape can release a view for possibilities: historical scenery, industrialised landscape, fantasy landscapes, perhaps also virtual reality which has been developed with the computer.

2.3 Concept of a didactical program -

Further differentiation of the six fields of activity



I

First field of activity:

Intuitive system formations by comprehending water formations

Introduction to the field of activity

When playing with water at a well or in a recreation area, the complexity of can be experienced water with all its senses. Hear the rushing of water, taste it, feel its temperature, observe and influence the changes of its form.



In nature, water movements take place in larger contexts. An outing to a stream or river are enriching experiences which had previously been collected at much smaller locations.



Experiences gathered when dealing with water can be used when you not only devote yourself to the phenomenon of water but you can also form it and influence it. This model of a well which was developed by students is laid out organically and shows similarities with different part of a skeleton from a mammal.



▲
 In the dance flow one can put oneself in the position of the water, feel one's way into its flowing movements and express them.



▲
 For people, water was, at all times, a phenomenon full of magic. Sites of archaeological and cultural interest can be visited, poems, sagas and legends can be collected in order to pursue traces of earlier relationships of people to the "water of life" that humanity wanted to gain for itself.



A bridge to the “Zone of the next stage of development“

If you put the “water of life“ in cupped hands, a point of time comes when one stands before losing it. But the next person can then catch it in his hands and again the next person in turn and so on. A system exists in the form of a “handwell“ in which everyone is a part. If just one person jerks his hands, then the whole system has to react in order to counteract the disturbance.

Fundamental experiences with system formations are gathered here: There are parts and simultaneously a system as an entirety. The human being is part of this system, just a minute disturbance effects the whole system and can have major effects there.

Intuitively such systems formations are completed both materially by using the entire body as well as on an ideal level by more or less conscious reflection and by being aware of the occurrence.



A hand well occurs when the water flows from one pair of hands into the other and from the last pair it can be returned to its original point of exposition in order to start the process again from scratch.

II

Second field of activity:

Artistic system formations by deconstructing common significance and creation of new significances of forms

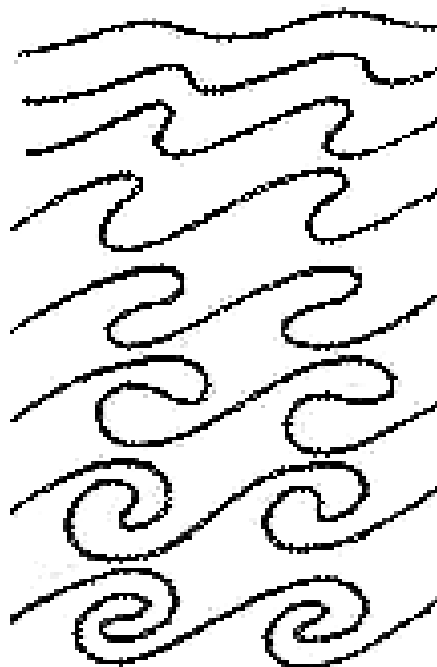


Introduction to the field of activity

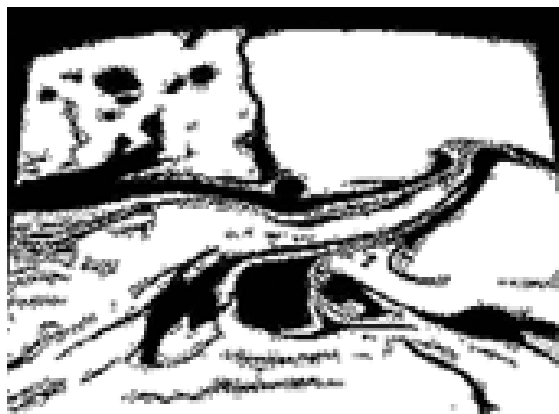
A little oil paint is added to the surface of the water, a stick is led in a straight line through the water and results in light turbulence. If you put a page on top of the surface, press it down lightly and then lift it up, the form of the water is caught in a picture.

First of all, the manipulation of the water with the oil paint makes it possible to catch fleeting water figures. Moreover, when lifting up the paper a separation of the form of the water is completed as the contents.

In order to gain an insight, a person has to create his object first. In a second step, he can examine it and then gain knowledge on the matter, which he/she more or less consciously had put into the constitution of the object previously.



In the drawing of the forms, the path leading from a straight line to a spiral which tends to role inwards can be experienced.



If you lay paper over the entered water form, then you can follow the outlines and the course of the lines. A field of tension between the straight lines and the spiral forms becomes obvious.



In medieval art, the form of still water is used to impart a certain view of the world. Everything has a harmonious order which was created by God.



The Brazilian painter Vagner Dotto (†) used turbulence in order to express his view of the complexity of the modern world. A flat, static form is no longer chosen but a dynamic entwined spatial form..



A bridge to the “Zone of the next stage of development“

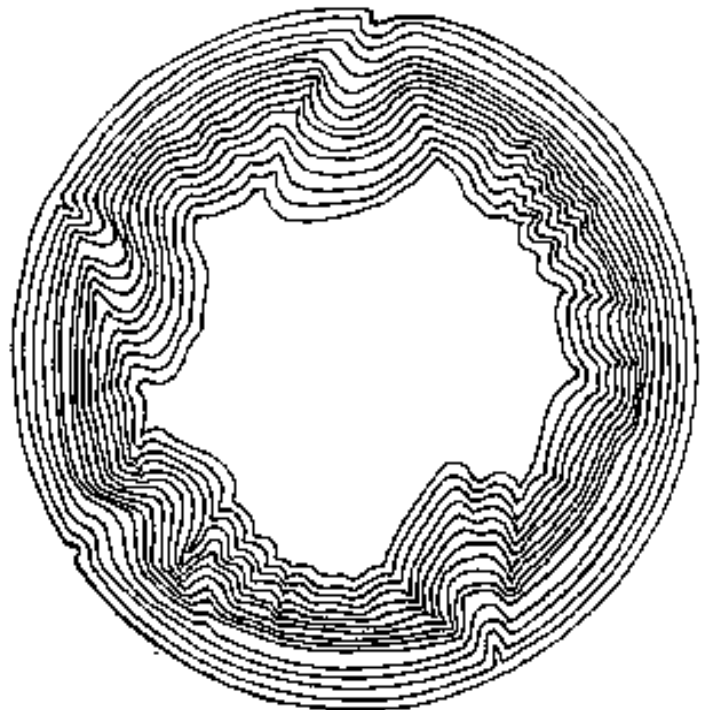


Production of woven lines in a group

Every group member has a colouring pen in their hands and draws, directly following the line of their predecessor at a parallel distance which arises by making a turn around a table. Even a slight disturbance in the guidance of the lines is also taken into consideration by the next member and is woven into the entire form. A complex system arises which shows similarity to the lines of fluid particles.

Also here, fundamental experiences are made again with the system formations. The individual is a part of the whole, he contributes to the origin of the complex form. Also here, small disturbances can have major effects on the straight lines.

The phenomenon of water has now been put in the background. The artists are engaged in producing something formal which can stand alone for itself and is sufficient in itself.



III Third field of activity:

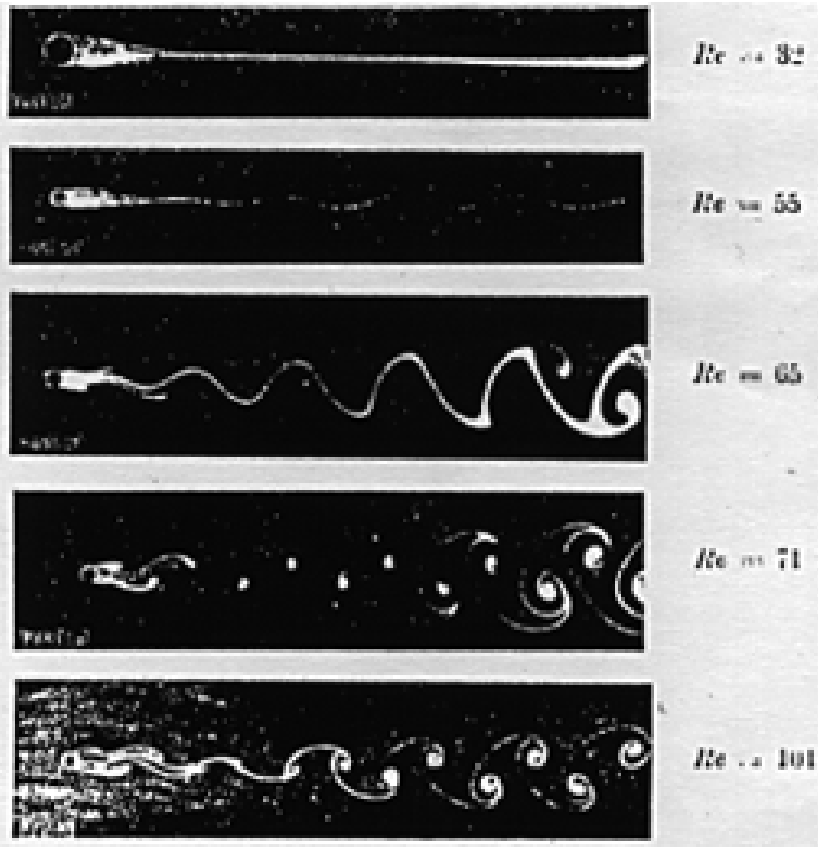
Scientific system formations on the basis of particle concepts

Introduction to the field of activity

How do forms occur in water? In order to find an answer for this question (little particles are shaken on the water (seed traces, shavings of graphite particles from a pencil, dried spices etc.) If you produce turbulence by drawing something through the water, then you see how the particles remain near to each other and then go their own way before contributing to the formation of a whirl.

Here also the manipulation of water as a research object enables again the transition to new insights. The object is constructed in such a way that it is influenced by “theory“, in example on the basis or in connection with the experiences gathered in the group when drawing a weaving of lines. If one is part of a system there, then distance is adopted and re-garded externally. However one produces figures and forms as an active subject in interaction with the water.



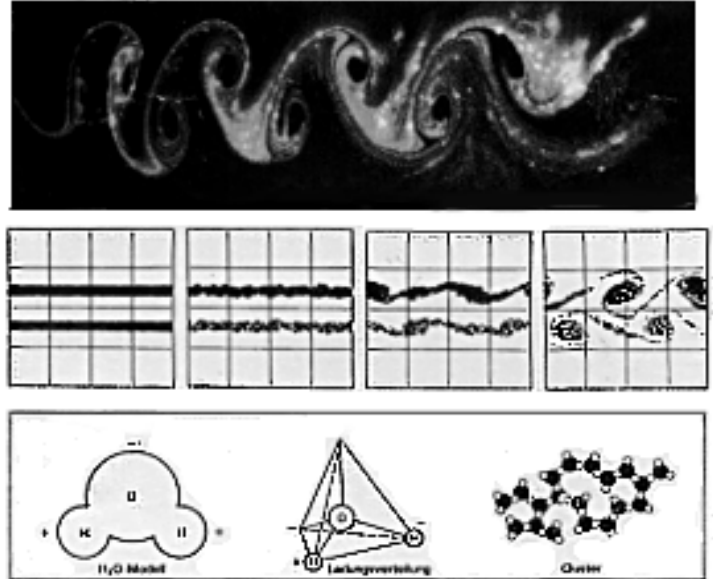


If one experiments with particles then it becomes recognisable that its behaviour is dependent on three things: from the form of the disturbance, from the flowing speed and from the viscosity of fluid. With the Reynolds number, the relationships between these parameters can also be expressed. The lower the REYNOLD- number, the more order, the higher, the more chaotic it is. The ideal KARMANic turbulent path is situated exactly on the border between order and chaos.



In scientific images the particles are illustrated by dots. If one systematically combines the results of the series's of experiments, then one sees that the forms fall more and more apart on the way from order to chaos.

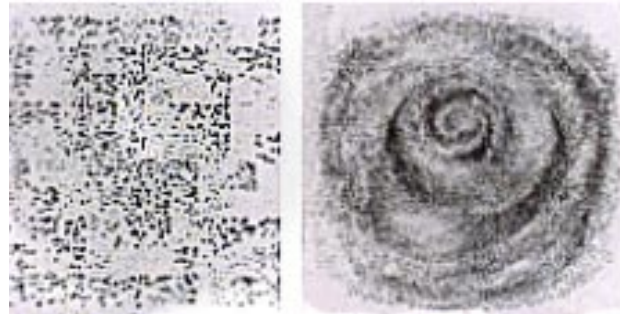
Historically, research interest was mainly directed towards the "correct", laminated currents: they were controllable, mathematical and practical. Firstly chaos research is developing new means for testing nowadays at least from ways of order to chaos.



From the water bath in which the particle behaviour is researchable on the macroscopic level, one can penetrate deeper and deeper in the world of the particles to the “volume elements“ which have been visioned. By examining given and potential relationships between the elements, one acquires the knowledge which is depicted in structure diagrams. Dots represent the elements and connecting lines of the relationship here.



A bridge to the “Zone of the next development“



In the science images and structural depictions dot elements represent fluid particles and are tied to a certain material which is present in nature.

If dot elements are freed from this tie of contents, then the relationships between them can be randomly produced. One can produce a variety of patterns now with these abstract elements which only signify themselves by experimenting with their distributions. A new means for this is the computer in which a painting program lets dots appear on the screen by using simple mouse clicks.



IV

Fourth field of activity:

Formal-abstract system formations through the research of computer-generated amounts of dots

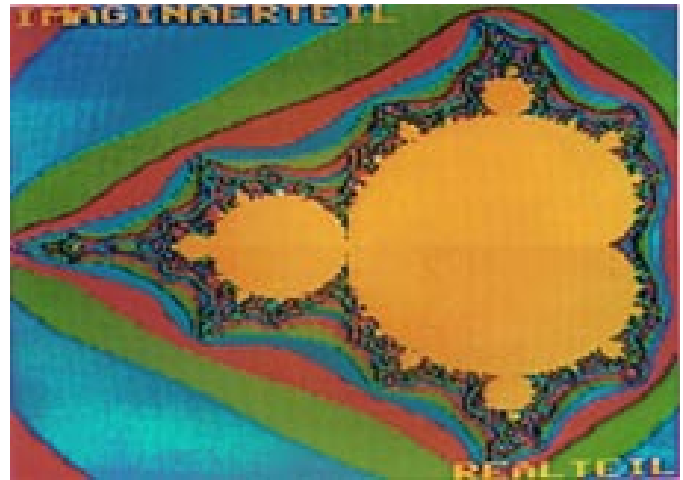
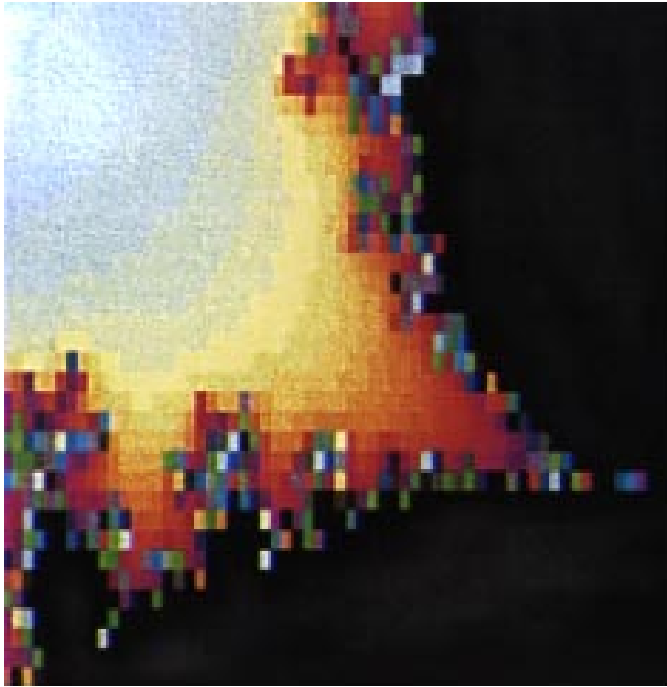


Introduction to the field of activity

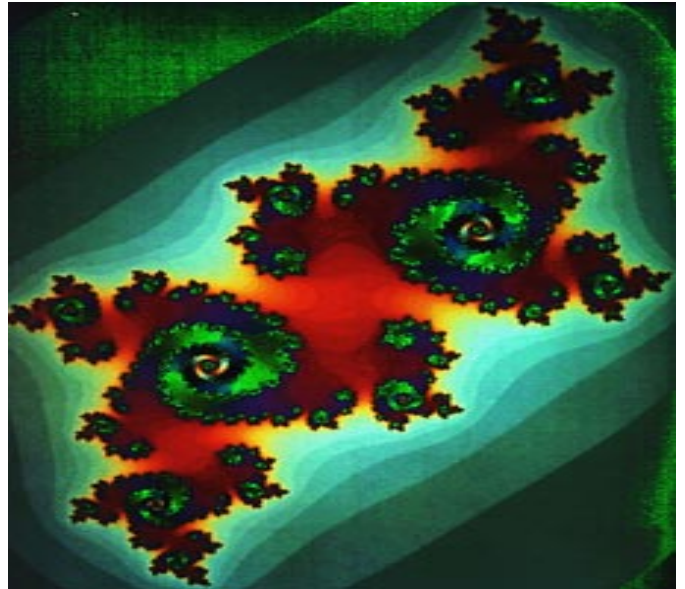
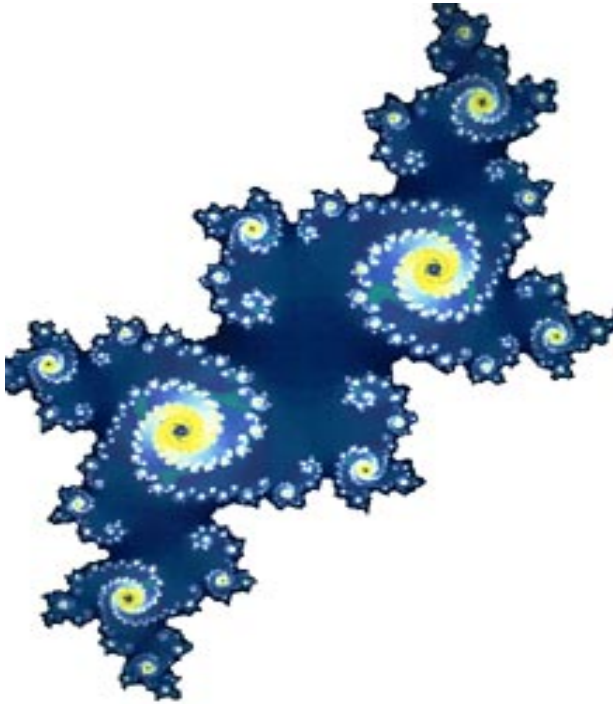
Experimental mathematics, a branch of modern chaos research puts means nowadays at its disposal with which the computer generate amounts of dots of which very little influence can be taken. There are forms of an individual beauty which has been allotted to the ability of self-organisation.

Many of these images however look like turbulence in water but they are only abstract amounts of dots, which solely just stand for themselves and do not represent any fluid particles.

With this, the water has totally disappeared. Only abstract elements are left over which form a world for themselves.



On the one hand, one is determined by these computer generating images which organise themselves. They are human constructions at the same time, and by fixing the starting value or determining excerpts through which one penetrates deeper and deeper in the amount of dots and can always gain new and surprising images.

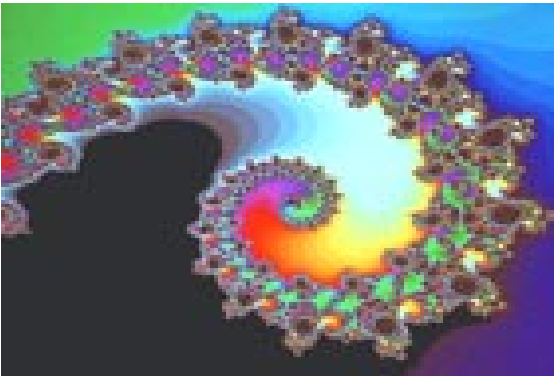
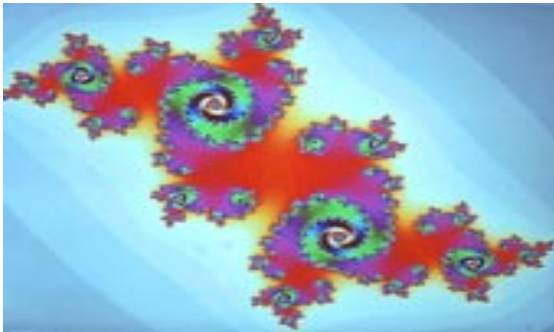


▲
The research of such abstract computer-generated amounts of dots contains the result that the form of self-similar forms are comprised of different sizes such as spirals, which can be recognised as fundamental by water movements.

▲
In computer animations (animare = give a soul to, breathe in life)= also lets static amounts of dots be put into movement. Virtual realities originate (in which immaterial forms travel through “impossible worlds“).

V Fifth field of activity:

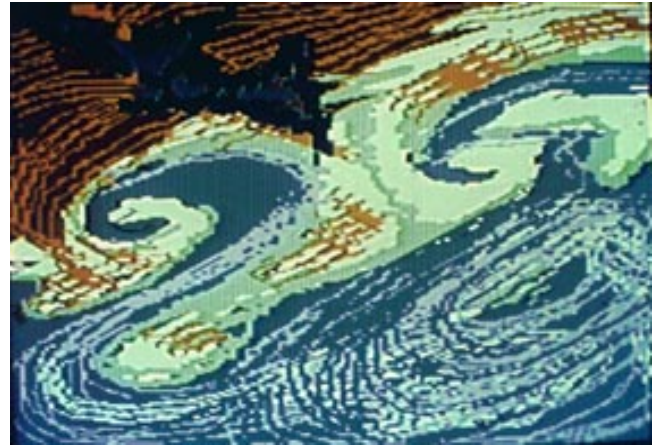
Technological system formations:
artefacts



Introduction to the field of activity

Abstract amounts of dots mean and represent nothing but themselves.

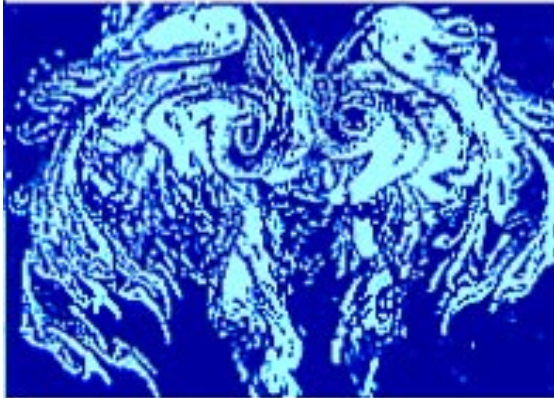
They are “technical images“ (Vilem Flusser) which in comparison to traditional images no longer illustration of given reality. If a person wants to avail of them then he has to carry out imaginary drawings in the abstract dots, in order to give them a meaning. This is possible via associations and analogies by saying “This abstract amount of dots looks like turbulence in fluid“. Then you have to search systematically for sections in the amount of dots, which resemble figures, forms and structures of movements from fluid.



Imaginary images which are undertaken in abstract amounts of dots lead to artificial worlds which can also be called *virtual reality*. They are namely no contents or concrete water worlds or illustrations of these which appear on the screen but unreal worlds. The proximity to reality of these fictive worlds can be intensified when a person approaches the systems which organised themselves with the help of painting programs and is closer to the real world?? From the scurly figure of a “little apple man“ a scenery can originate in which the amount of MAN-DELBROT appears as a lake and is an integrated element.



Abstract amounts of dots can also be gained along the way: water images can also be played into the computer with the help of a video camera and digitalised there. The images which appear on the screen are no longer traditional images, but technical images which have been compiled of swarms of dots. Therefore, they can be randomly manipulated with computer programs. By discolouring, compressing, stretching, reflecting etc. artificial water world can also be drafted.



Computergenerierte Wasserwelt in dem Science fiction Film ABYSS



Computer images can also be brought to life by animation programs.

The images which are shown here are sections of a computer animation “Metamorphoses of a turbulence street“ which was developed by the “Arbeitsstelle für Computergraphik in der Ästhetischen Erziehung“ of the College for Arts in Braunschweig.

Just like in science fiction - the film ABYSS utopic water worlds have been developed.

Bridge to the “Zone of the next development“

By carrying out imaginary images in abstract amount of dots and then giving them a meaning a world of abstract possibilities is brought into relation with a world of abstract possibilities. A first step is carried out in the direction of reality from which one removed oneself step for step in previous fields of activity.

The question can now arise: how can the contrast between reality and possibility be imparted productively? Ernst Bloch suggested the development of “concrete utopias“ for the development. On the basis of a historical reappraisal of utopia in art and science, technology and society? the idea of a “natural alliance“ which is to be understood as a partnership between humanity and nature.

These ideas can be put into practise by making a comparison with the idea of the French garden with the English one: Whereas the French garden forces nature into a strict order, the English one attempts to bring the self- organisation of nature with human ideas on design in a productive interplay.





VI

Sixth field of activity:

Designing concrete utopias

Introduction to the field of activity

After water, as a point of exposition, the development of images was torn in fine dots and finally disappeared behind an abstract amount of dots the drafting of fictive fluid worlds has started on a backward road to the concrete and contents. This change of direction was intensified when video images of a scenery from the direct vicinity in which one lives were made and then to the point of exposition as a draft of variants of this scenery in the computer.



▲ In models, drafts, drawings but also in the form of modern multimedia presentations the past, present and the possible future of the environment with which one lives is worked on and introduced.





In countries with highly developed science and technology the majority of flowing waters have been canalised in order to prevent floodings and to use the water power more effectively. It can also be analysed which consequences this order of water has and if a design (“renaturalisation”) that is closer to nature would not be more appropriate.

Reflections concerning a design of flowing waters that is close to nature often leads back in the history of a location as the water was as nature had made it and not canalised. If one occupies themselves with the line of arguments that lead to the changes of water courses in the past, then the advantages and disadvantages become clearer and thus prevents making biased decisions too quickly.



Discussions on concrete utopias, in which possible futures are introduced to a scenery are on the one hand possible with the directly involved people and other citizens in a certain community.



Discussions on possible futures of a landscape can also be led in a national or even international framework when computer networks such as the INTERNET or ecological networks such as GREEN are included. One can become closer to the demand: “Global thinking, local action“ with the use of these means of communication.

2.4 The six fields of activity in a short overview

gestalt



Gestalt:
Original totalities

Unity of content and form

Possible activities:

Excursion to a flowing water area:
Understanding water in a playing-land-
scape or at a well / painting and
drawing water movements / taping
water sounds / tasting water / feeling
water / water games and building in-
door wells / visiting cultural locations /
collecting water symbols from
different cultures / meditating on water
/ interpreting cultural customs / joining
a landscape ritual / depicting water in
dance

forms



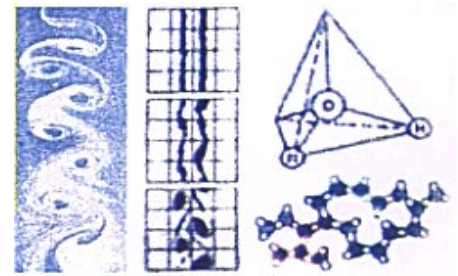
Forms:
Outlines of forms

Separation of content and form

Possible activities:

Production of marbled paper /
developing outlines on transparent pa-
per / drawing water forms / studying
the development of forms (i.e. straight
lines, spirals) / Analysis of the use of
water forms in works of art / Analogy
formations: developing landscapes,
faces, animal forms etc. from water
forms / drawing weaves of lines in
teamwork / searching for spiral forms
in different areas: architecture, biology,
history of civilisation

structures



Structures:
Elements and their relationships

Break down in fundamental elements

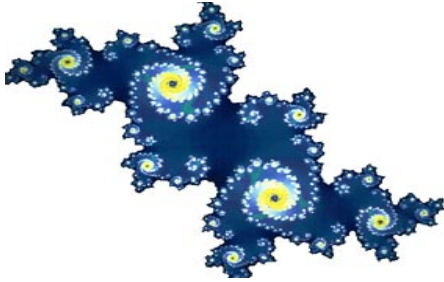
Possible activities:

Researching the behaviour of particles
on the macro level / experimenting
with the REYNOLDS - number:
relationship between forms of
obstacles, flowing speed and viscosity /
research of the behaviour of particles
on the micro-structural level when
using the microscope / chemical water
surveys / reconstructing historical
developments in the science of currents
/ applications of knowledge of research
in currents in the field of technology

Phenomenology / structuralism: Discoveries

Traditional images: Illustrations of reality

texture



Textures:
Randomly combined elements

Abstract amounts of dots

Possible Activities:

Producing iteration equations with series of calculations / producing amounts of dots with the computer and varying them by changing the values of the parameters / letting complex systems emerge with geometric generators (KOCH - curve, fractal plants, animals, landscapes / examination of self-similarity

artefact



Artefacts:
Amount of dots with and without meaning

Virtual realities

Possible Activities:

Choice of fluid similar amount of dots / formation of amounts of dots to fictive fluid worlds / digitalisation of fluid images / alienation of digitalised amounts of dots with painting programs / draft of utopias with digitalised and generated amounts of dots

concrete utopia



Concrete utopias:
real / possible

Possible futures

Possible Activities:

Reconstruction of landscapes with flowing water / ecological examinations / development of models, plans, multimedia presentations etc. / discussion of the drafts with concerned people and citizens / discussions in the Internet and / or ecological networks such as GREEN

Serialism / Systemtheorie: Inventions

Technical images: Imagining meanings



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