

**Contributions of Systems - Theory to the Understanding of  
Therapy and Health**

Georg Ivanovas, Milatos

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Under the guidance of  
Prof. Nikolaos Paritsis

Promoters

Vlasis Tomaras, Athens  
Vassiliki Papadioti, Ioannina

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## Acknowledgement

This thesis is a work of many limitations. Only two shall be mentioned. Firstly, I wrote it in a foreign language. For me it had a positive effect. It made me aware of inconsistencies in my reasoning which I usually cover with a figure of speech using my mother language. This is a common tendency. We all conceal our logical gaps with certain locutions believing that thereby things are sufficiently explained and/or proved. But often, too often, this is not the case. This might be one of the reasons why Beckett, who aimed for an absolute precision in his works, did not write in his mother language.

Whereas it had been of some benefit for me to use a foreign language, I am well aware that this is no longer true for an eventual reader.

A second limitation is the amount of subjects dealt with. As it is already difficult to be an expert in only a sub-category of any of them, it would be presumptuous to make valid statements about all of them. The scale of issues necessary to create a picture of the systems view in medicine is beyond the possibilities of a single person not affiliated to a university. Hence, a lot is only superficially touched and many conclusions are but provisional. Moreover, mistakes are unavoidable. But, as said in the introduction, the aim of this paper is not to provide a definite content. Its aim is to reflect on the strategies we use to come to conclusions. Anyhow, I hope the text might be of some use for a reader, especially as controversial statements are often more helpful to specify the own view than well-balanced considerations.

I came across the subject during an advanced training in systemic psychotherapy by Prof. Nikolaos Paritsis at the University of Crete (Greece). The theories and strategies of the early proponents of systemic psychotherapy changed my understanding of the world within a few months. All of a sudden, everything in the realm of medicine became meaningful to me. Consequently, I proposed Prof. Paritsis this thesis about the application of systemic principles to the subjects of general medicine. This was in the year 2000.

Many people supported this work during all these years. First of all, Prof. Paritsis who provided me with a totally new view of the world and went with me through all the sections of this thesis. Secondly, Prof. Vlassis Tomaras, the second appointed

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My children grew up during this decade and often, too often, my time and my creativity for them had been restricted. It was a typical *value decision*. I still do not know, whether it was the right one.

Crete, August 2009

**This work is dedicated to Prof. Paritsis and to all teachers  
extending the understanding of their students.**

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<sup>1</sup> Ewert R, Ivanovas G (2005): *Systemic thinking and Chinese medicine – a relational exercise*, 3<sup>rd</sup> Panhellenic Conference on Systemic Therapy, Heraklion, Crete 21.-23.10.2005

**Life is short,  
the Art long,  
opportunity fleeting,  
experiment treacherous,  
judgment difficult**

Hippocrate Aphorismes (IV: 99)



# 1. Introduction

When I started this thesis in the year 2000 it was a pioneering work. Systemic ideas in medicine were practically non-existent. This was slowly changing when the work was first finished in 2005. From that time on articles on systemic biology and medicine mushroomed. It seems that the time has come that these principles enter the medical discourse.

As this work has never been published due to certain delays much has been expressed more detailed and better in the meantime. Thus, parts of this thesis may be somehow 'outdated' in terms of novelty. It became even apparent that recursive logic is necessary to understand biological processes (Isalan/Morrison 2009). Or ideas like that of a 'viral flora' (Ivanovas 2006) are now discussed occasionally (Holmes 2007) although not as a generally accepted fact.

Anyhow, this work might still have some value, as it discusses the epistemological foundations of a systemic medicine more detailed than specialised articles and reviews. Moreover, it has been written from the practitioner's point of view. That is, it includes a lot of empirical observations, rarely found in normal scientific papers.

A good example is the field of epigenetics, as it is called today. Until recently everybody who claimed that there is a transmission of inherited characteristics would have been regarded as heretic and would have been burned on the pyre of the scientific opinion. Nevertheless, such formerly heretic and now modern opinions exist. Homeopathy always had a rather elaborate model of how acquired infections might contribute to the development of chronic diseases in the offspring. Such an empirical knowledge might contribute more to the understanding of epigenetics than laboratory testing with rats.

We see here a typical example of the area of conflict between observational medicine relying on empirical evidence and a 'scientific' medicine relying on laboratory experiments and randomised trials. This conflict is essential for medicine (Vandenbroucke 2008) and will be discussed in many different regards.

Until now, empirical knowledge had been mostly neglected. One reason is prejudice. Simple observation is often discredited as unscientific. However, in order to understand such complex and nonlinear issues like robustness and the self-

organization new strategies of observation are necessary. The reductionist setting just does not do it anymore. That is, an emphasis on observational medicine is a natural consequence of the new direction medicine has to take in order to solve the forthcoming problems.

This thesis is absolutely biased towards the observational arm of medical science. Of course, this is a controversial attitude, difficult to get used to. But it is somehow a natural response to the one-sidedness of the last 50 years.

Another obstacle for the usage of empirical knowledge is language. Most clinical observations are made outside of the scientific frame of the universitarian medicine. They are mostly made by people not or insufficiently trained in the scientific method, more often than not using a kind of obscure theoretical framework. This becomes especially true when observations of former centuries based on archaic theories are taken into account. To discard such a knowledge is – as will be demonstrated later – not appropriate.

In order to use such empirical knowledge it has to be translated into the scientific language. This is somehow difficult, as the current theory of medical science does not provide an adequate terminology and/or epistemology to evaluate empirical knowledge. That is, the current scientific approach is defective when it comes to the assessment of individual human reactions.

The appropriate epistemological tool for this purpose is systems theory. Nobody earnestly concerned with biological and medical research today doubts that systems theory is the key for future research. A search in the database of the *European Science Foundation* with the key word ‘systems biology’ might be proof enough.

However, it requires a close acquaintance with the underlying principles to apply systemic concepts. No article on systemic biology and medicine should be published without a detailed knowledge of recursive processes. Unfortunately, this is mostly not the case. More often than not a systemic vocabulary is just used to promote old linear concepts.

The main concern of this work is not about the issues discussed. The main concern is *how* it is possible *to think* about such issues. Of course, it is a rather serious question whether current medicine creates a rigidity in the humans leading to a reduced adaptability. But not the question as such is important in this context. Important is how we become able to model, conceptualise and discuss these kinds of subjects. It is

my strong conviction that it is less important *what* we think, in order to solve the impending problems. Important is *how* we think.

\*

It is often heard that medicine is in a crisis. Of course, there is an ethical crisis concerning stem cell research, cloning or the question whether a single, unemployed woman living in a three room flat having already six children should really deliver octuplets through fertilization treatment – requiring 46 physicians and helpers only for the delivery (Harris 2009). This might be a medical success. But should really everything be done that could be done? There is an economic crisis, as well, as it becomes ever harder to afford current medical treatments. Moreover, there is a medicalisation of medicine (McLellan 2007) as nearly everybody is treated with drugs from before birth until death. 40% of the German population are continually treated with drugs. Among elders above 65 years the percentage is 80%, not included the over the counter drugs (ABDA 2008). Addiction to medical drugs became a major problem (chap. 4.6) and fatal side effects of drug therapy sum up to 3% of all deaths in the general population (Wester et al. 2008). But even deeper is the crisis concerning the whole orientation of medicine. Medical thinking became very restricted. “Medical schools had become schools of molecular biology and biochemistry, rather than schools of medicine” (Herbert Simon cited in Rees 2002). As a result, clinical research is neglected or even “dying” (Clark/Smith 2003), as some judge. And primary care tends to leave everything to specialists (Bodenheimer 2006). The very reason for this crisis is – to a large extend – that the logical and epistemological developments of the last hundred years have never been incorporated into the medical discourse and thinking. On the contrary, as it will be demonstrated, scientific medical thinking made a step backwards since its programmatic formulation through Bernard 150 years ago (Bernard 1865). When Bleuler 80 years ago described the medical thinking of his time as autistic and undisciplined (Bleuler 1962) there still was a lack of suitable tools to cope with complexity. But although the logical tools are now available, they are not applied in medical research and practice.<sup>2</sup> Therefore, the statements of Bleuler are still up to date.

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<sup>2</sup> Bateson, a major forerunner in complex thinking, resumed after having taught all kind of medical professionals from college students to experienced psychiatrists: “I have encountered a very strange gap in their thinking that springs from lack of *certain tools of thought*” (Bateson, 1980: 27).

A minute analysis will show that the overemphasis of the so called ‘scientific approach’ is not more scientific than a lot of ‘unscientific approaches’ that have been discarded the last decades.

Some time it seemed that evidence based medicine (EBM) would be a key to solve the current crisis, but this is not the case. EBM is subjugated to the same epistemological inconsistencies and fallacies that characterize the whole experimental approach (chap 2.5).

General medicine is in a sort of dilemma which I have call the *practitioner’s paradox* (chap. 2.1.g). A physician has knowledge of the function of parts (provided by anatomy, physiology, biochemistry and pharmacology) and of populations (provided by trials). But it is an insular, uncorrelated knowledge, not able to represent the complexity of medical practice. For example, “a lot of data exist about treatment of chronic obstructive pulmonary disease or management of type 2 diabetes for patients younger than 75 years. There is, however, little evidence about how to treat an 82-year-old patient who has both disorders” (Maesemeer et al 2003). In fact, when we see it strictly, there is *no* evidence.

Patients have to be understood as a whole and not only in their parts. It has to be understood what really constitutes their illness, something that exceeds the simple diagnosing process. “Without the ability to do this, textbook knowledge is singularly futile” (Swales 2002). Medical education does not provide an according knowledge. The best proof is the experience of every physician opening his/her office (Lancet editorial 2004). Patients have a lot of unclear symptoms leading to “extensive somatic investigation and treatment, which is largely ineffective and sometimes iatrogenic” (Ring et al. 2004). This problem is not due to a lack of scientific knowledge. It is due to the false or non-existent complexity management in medicine and “throwing more money at such problems is unlikely to produce meaningful or sustained change” (Clark/Tugwell 2004). In order to treat a particular patient in a specific situation a kind of contextual evidence is necessary (Maesemeer et al. 2003). There have been attempts to solve this problem. British undergraduate teaching has totally changed recently promoting a problem based learning. As this dismisses the usual way of understanding medicine, it has been harshly criticized (Williams/Lau 2004).

In the US the *Initiative to transform medical education* aims to improve the learning situation with many different measures. One are courses of the ‘narrative medicine

movement' where students have, for example, to read and write literary texts. The aim is to improve the ability to communicate with patients (Smith D 2003), to understand better their individuality (Chen 2008).

Both attempts have something in common. They tend to change not so much *what* students think, but *how* students think. This can exemplified by an analysis of the *scientific and the artistic approach to medicine*: "Physicians are taught to shun conclusions based on single experiences and to look for evidence based on a substantial number of cases. Consequently, their approach has to be statistical. Writers, however, seek out anecdotes as a way of making larger statements, a way not just of capturing attention but of highlighting a point. The anecdote or individual story is the natural language of the writer. Similarly, writers tend to shun statistics. In the writer's world, statistics obscure souls. Whole lives get gobbled up by whole numbers. If nothing is real to medical researchers except as it happens to a significant number of people, nothing is real to a writer save as it happens to a single person.

The medical scientist is trained to avoid conclusions except on the basis of repeated experiences. He reasons from the general to the particular. The writer is readily attracted to individual experiences. He reasons from the particular to the general and searches through the crowd for the few faces that can become the biography of their times. In novels, the experience of a vast aggregation of human beings becomes real only as it is portrayed through the lives of a few individuals. The evils or ordeals lodged in sectors of society are best understood in terms of their impact on individual lives and have meaning precisely because readers see themselves in the story. Reality rides on direct connections from one life to another." (Cousins 1990: 12-13).

What we see here is a good description of the practitioner's paradox. That is, medicine is much more artistic than the scientific picture suggests. The former editor of the British Medical Journal (BMJ) even compares doctors with jazz musicians, not with scientists (Smith 2004c). This is a good metaphor, even used in economics (*Jazzonomics*), meaning that jazz and economics are played in a collective context. There is a rhythm. You pick it up. You go into the tune. And then you improvise. There are no clear cut plans. They are not possible, neither in jazz, nor in economics. You have to follow what comes up. (Ostrowski 2009). The same has to be presumed for medicine. If plans are followed too strictly, the patients may have to pay for it.

*The Lancet* has its column about the ‘art of medicine’ and, of course, medicine has been called an art from ancient times on. Consequently, the advices of BMJ’s editorial board to young doctors are centred around other issues than scientific truth. They have much more to do with the attitude and with human values. The 12<sup>th</sup> advice even says “Don't believe what you read in medical journals and newspapers” (Smith 2003f, appendix I).

However, there is a certain fallacy in this discussion about the dichotomy between art and science. This dichotomy does not really exist. It is a characteristic of the map (chap. 3.8), of how we understand science, not of the territory – the practice of medicine. The impression of some medical textbooks that it is possible to treat a disease in the absence of a physician and of a patient is wrong. As long as there is a difference between a (scientific) medicine in theory and an (artistic) medicine in practice the used epistemology must be defective.

It really would be poor reasoning to maintain that it is simply impossible to say something scientifically about a single patient. It also would be poor reasoning to regard the relation between the physician and the patient as being no part of the ‘real’ science. And it is still poor reasoning to neglect the wider frame of the social context and/or to define it as ‘non-medical’ (chap. 3.6). A simple example is the cholesterol discussion: An intense media campaign has convinced people that it is most important to lower cholesterol levels. Thus Liptor® (Atorvastation) became the best selling drug ever with sales over 8 billion \$ (McKinnell 2003) and many patients believe that cholesterol is a kind of unavoidable poison. After the ENHANCE study failed to prove that Vytorin® (a combination of two cholesterol lowerers) performs better than a placebo (Greenland/Lloyd-Jones D 2008, Kastelein et al. 2008) leading cardiologists explained publicly that “the idea that you’re just going to lower LDL and people are going to get better, is too simplistic, much too simplistic” (Berenson 2008b). Others even declared that the whole cholesterol issue is but an unproven hypothesis (Taubes 2008). Such events remind us that medicine is also big theatre and – in order not to forget the artistic part of medicine – that we are all protagonists in a *comédie humaine*.

Nevertheless, a science of medicine has to provide the epistemological tools to investigate even these events. How shall we conceptualise the current paradigm of ‘medicine = giving a drug’ in a scientific frame? Of course there is an ongoing tendency to make medicine more ‘scientific’. But if the human nature of medicine is

not understood, any 'solution' is more a part of the problem than a part of the solution.

A first attempt to overcome some of these difficulties was the psychosomatic movement of the last decades. But it was not able to fulfil the expectations as it was also conjugated to the same epistemological restrictions as the normal scientific medicine. That is, it had no tool to deal with complexity and remained within a two valued logic (chap 2.3).

Modern epistemology, especially systems theory provides the necessary logical tools to solve the problems posed above. It enables to conceptualise a lot of current open issues and gives insight into deeper structures leading to a better understanding of health and therapy.

The aim of this thesis is to apply the concepts of general systems theory onto medical thinking, to formulate old and new medical insights and to provide sound categories for a discourse on medical complexity.

In the **first section** of this work I will make an attempt to define the current medical paradigm and try to show its limitations on following levels:

- the lack of fundamental logical tools leading to inconsistencies in descriptions and reflections,
- the impossibility to cope with complexity, as complexity is presently excluded by definition,
- the total neglect that medicine is a human affair.

In the **second section** relevant epistemological fundamentals of the last century are presented and connected to medical issues, in order to show their impact.

The **third section** comprises cybernetic and systemic concepts. These tools are important to understand and to conceptualise organisation. There is a growing use of such tools now, but mainly in basic research as in biology, less in medicine.

The most important attempt to use systemic models was undertaken by systemic psychotherapy providing a solid ground for the investigation of medical structures. But also other methods of the so called empirical or observational medicine have used similar models since ancient times. That is, physicians always had a systemic approach. The discussion of such methods like the systemic psychotherapy, Hippocratic medicine and some parts of the so called complementary and alternative medicine (CAM) is done in the **fourth section**, demonstrating that old observations

are in line with current concepts of health and disease and often exceed them in their understanding of organisation.

In the **fifth section** I will try to combine different findings and to pave a way towards a systemic medicine, that is, a medicine which is based on the understanding of complexity and self-organization.



## 2. The Medical Paradigm and the Anomalies of 'Normal Medicine'

### 2.1 The medical paradigm

What is our medical paradigm? Is it what the *Journal of the American Medical Association*, the *New England Journal of Medicine*, the *Lancet*, the *British Medical Journal* and all the other similar journals present? In a way yes. They create a standard by only publishing papers that (on a meta-level) fulfil the expressed and unexpressed criteria how medicine should be. This has been called a „publication bias *in situ*“ (Phillips 2004), something far away from an ‚evidence based publishing‘ (Tite/Schroter 2006).

However, “the process (of selecting papers) has been designed to benefit authors not readers. The authors need to get their work published in order to gain academic credit, promotion, and the next grant and often don't care whether anybody reads what they write” as the former editor of the *British Medical Journal* admitted (Smith R, 2003c). On the other side, in order to be published, the authors write (on a meta-level) how medical journals want papers to be. It is a recursive process that, in effect, creates the paradigm of medical journals. As a result, there is a danger of evidence-based medicine to pursue what is possible and available rather than what is relevant” (Maeseneer et al. 2003)

Often the result is not what physicians need. There is a “10/90 gap, whereby less than 10% of health research is concerned with the conditions that account for 90% of global disease, (and this) may well be a 1/99 gap when it comes to health information” (Smith 2004e).

That is, research does not investigate what physicians encounter, but what scientists are funded for. And they are funded for subjects that are often published. “Systematic reviews follow the priorities of established market economies rather than global priorities” (Swingler et al 2003). By this, published medicine does neither match nor represent practiced medicine.

As medical journals provide a strange collection of results, unrelated in inner meaning and unrelated to medical practice, mainly in a boring manner (British Medical Journal 2004a) every practitioner has to find his own way through this jungle. He creates his

own style, a mixture of theoretical knowledge, para - universiterian tradition, own experience and mom's advice, something that has been called the '*unofficial model*' (Uexküll 2001). It is important to understand that this is not accidentally so. It is, as will be proved, an unavoidable consequence of the current medical paradigm.

Some decades ago *Bleuler* called this kind of approach as 'the autistic-undisciplined thinking in medicine' (Bleuler 1962).

Maybe this accusation seems to be too strict, at first. But using a modern definition of autism – “impaired language, social and communicative deficits, repetitive and stereotyped behaviors” (Powell 2004) – Bleuler's claim is strikingly correct for the current medical paradigm. Despite the obvious fact that medical language and behaviour is often impaired and with communicative deficits (chap. 1) there is also an epistemological reason to compare medical science with autism. Reductionism (chap. 2.1.a) excludes by definition the relational aspects (chap. 3.7), depriving scientific medicine from a sound semantic structure (chap. 3.1). Just as some autistic persons are able to say the phone book by heart but are unable to make a phone call (as in the film *Rain Man*), the knowledge of facts is useless when not integrated in a semantic context. This phenomenon has been described as *savant skills* where the ability to process local information plays a key role (Happé/Frith 2009).

The repetitive behaviour is the attempt to solve a problem with the same approach that has led to the difficulties, where the idea prevails “that science is curative – that enough... information will bring about the resolution ...” (Whitaker cited in Roberto: 467). Such a situation is found when a ruling paradigm is not able to acknowledge its own shortcomings and to accept a new view (chap. 3.10).

### **a) the trivial concept of medicine**

Classical science in its diverse disciplines, be it chemistry, biology, psychology or the social sciences, tried to isolate the elements of the observed universe – chemical compounds and enzymes, cells, elementary sensations, freely competing individuals, what not – expecting that, by putting them together again, conceptually or experimentally, the whole or the system – cell, mind, society – would result and be intelligible.” (Bertalanffy 1968: xix)

The current medical paradigm is characterized by two main features: First, modern medicine is based on measurement. By that observations are quantified and experiments become comparable. Second, in order to cope with the complexity of

human physiology and pathology the observed phenomena are broken down into defined parts, a procedure called *reductionism*.

Under the conditions of such an experimental setting a certain range of observation is defined. In this range parameters and their changes through interventions can be coherently tracked. Thus, the concept of cause and effect is introduced.

The received descriptions and reactional patterns (physiology, pathology, biochemistry, etc) are called *specific*. Current medicine speaks of ‘specific’ diseases like rheumatoid arthritis, mononucleosis or diabetes mellitus. Interventions to alter such specific pathologies are called ‘specific treatments’. Methotrexate in rheumatoid arthritis, insulin in diabetes or neurotransmitters in depression represent such treatments.

This is, in short, the foundation of modern medicine which dates back to the middle of the 19<sup>th</sup> century. Most important in its development was Claude Bernard (1813-1879). He was not only an outstanding observer and scientist. He also formulated the basics of modern medicine. He anticipated – as we will see – biological and medical models that arose only lately. His book *An Introduction to the Study of Experimental Medicine* (1865) is, in fact, a masterpiece of medical thinking and it served as an introduction for medical students still a hundred years later. Most of his statements are valid until today.

However, Bernard was a contemporary of Laplace and he strongly believed in determinism which turned out to be wrong. He wrote: “Confidence in absolute determinism in the phenomena of life leads....to real science” (Bernard: 69). “When once the conditions of a phenomenon are known and fulfilled, the phenomenon must always and necessarily be reproduced at the will of the experimenter” (Bernard: 67-68). “But the real and effective cause of disease must be constant and determined, that is unique, anything else would be a denial of science in medicine” (Bernard: 83). “Absolute determinism exists indeed in every vital phenomenon; hence science exists also” (Bernard: 65).

He also formulated already the principles of reductionism: “When faced by complex questions, physiologists and physicians, as well as physicists and chemists, should divide the total problem into simpler and more and more clearly defined partial problems” (Bernard: 72).

Determinism and reductionism together constitute the machine model, the paradigm of Bernard's time: "A living organism is nothing but a wonderful machine" (Bernard: 63).

A medicine based on such a model does not differ fundamentally from the work in a garage where sick humans are handled like a broken car (Ahn et al 2006a). This idea has not changed since and some even expect no change for the future. "If you go to your surgery twenty years from now complaining of rheumatism, your doctor may well check out the relevant section of your personal genome CD-ROM rather than reach straight for the prescription pad." (Day 1998a).

*New Scientist* provided a collection of similar opinions: "Malcolm Lader, a psychiatrist at the Institute of Psychiatry in London: 'I don't see any fundamental technical obstacle to altering personality with drugs. After all, the traits that make up personality are rooted in neurochemicals.' And from Jerome Kagan of Harvard University, who studies the biological basis of shyness: 'Fifty years from now we may have drugs that can alter personality profiles. Things are moving very fast'" and creating the following scenario "Feeling irritable and melancholic, you reach for your computer and call up Normopsych, an on-line drugs service specialising in personality restructuring. After downloading your life history and personality profile data and completing virtual reality tests of rejection sensitivity and mood, you sit back in your chair. A few seconds later the screen fills with a rotating, three-dimensional image of the brain. A handful of neurotransmitter pathways are flashing ominously. The diagnosis reads: 'Serotonin levels 15 per cent below par in limbic system. Boost with 100 milligrams per day of MoodStim and AntiGrief.'" (Concar 1994).

Although these are somehow exaggerated opinions, they express the common understanding of medicine nurtured by the expectation that "although the road ahead is long and winding, it leads to a future where biology and medicine are transformed into precise engineering" (Kitano 2002).

But there is, as we all know, a problem with this trivialization of living processes. This shall be demonstrated with the 'polypill'. The polypill is a mixture of eight different drugs and vitamins effectively used in contemporary medicine. The pill should be provided for every patient over 55 with the expectation to reduce mortality of cardiovascular disease for about 80% (Wald/Law 2003). Astonishingly, most of the medical scientific community took this paper seriously and discussed the pros and cons at length. It is still held as an option worth of consideration (Smith 2005a). The

example of the polypill could be refuted simply by the fact that it violates Simpson's paradox (chap. 2.5.d). But this does not satisfy the basic epistemological question whether reductionist findings might somehow be synthesized and add up to constitute a whole.

Simple additivity surely is no solution, as additivity has the following pre-requisites:

„The first is that interactions between ‚parts‘ be nonexistent or weak enough to be neglected for certain research purpose. Only under this condition, can the parts be ‚worked out,‘ actually, logically, and mathematically, and then be ‚put together.‘ The second condition is that the relations describing the behaviour of parts be linear; only then is the condition of sumativity given, i.e., an equation describing the behaviour of the total is of the same form as the equations describing the behaviour of the parts; partial processes can be superimposed to obtain the total process, etc.” (Bertalanffy 1968: 19).

The belief in a simple additivity – as expected with the polypill – is an exception and even Bernard never had such a trivial sight: “Moreover, as we know, it happens that properties, which appear and disappear in synthesis and analysis, cannot be considered as simple addition or pure subtraction of properties of the constituent body” (Bernard: 90).

But how is it possible to synthesize the different findings provided by reductionist research? A solution often tried today is computer simulation. “The challenge ...is to develop mechanistic models that begin from what is understood (or hypothesized) about interactions of the individual units, and to use computation and analysis to explain emergent behavior in terms of the statistical mechanics of ensembles of such units” (Levine et al 1997). Probably every physiological mechanism has been simulated, including the heart (Noble 2002) and the brain (Graham-Rowe 2007). Such models are used to investigate *in silicone* (and no longer *in vitro* or *in vivo*) details of physiology, the impact of medications, the influence of environmental changes, etc.

But is computing the solution of the question whether reductionist research put together create a whole? Surely not, therefore “the result is that these models produce cartoons that may look like nature but represent no real systems... Yet it is fair and important to ask how seriously such predictions should be taken” (Levine et al 1997).

First, there is a problem that seems to be technical. If a model is too simple, it neglects essential mechanisms of the real system, limiting its potential to provide

understanding. If it uses too many facts the simulation becomes too complex and it will get lost in details (Grimm et al. 2005). Thus, complexity management is caught between the Scylla of reductionism and the Charybdis of arbitrariness (chap. 6.13). The actual problem, it seems, is not the lack of biological data or of computers. The main problem is the lack of a proper understanding of biological processes.

A central question in all these attempts is whether models are constructed ‘bottom-up’, i.e. from cellular compartments to the whole or ‘top-down’, from the whole to the cellular compartments (Noble 2002). Due to the reductionist foundations of medical science, the bottom-up approach is mainly favoured. Gene function and molecular action is computed in the hope to create reliable models (Mood et al 2004). Implicit is the expectation that the „knowledge of the genetic architecture will lead to increasingly realistic models of social evolution, while identification of the products of major genes can elucidate the molecular basis of social behavior“ (Krieger/Ross 2002). The same happens in brain research: “The truth is that we need to grasp what’s happening at the cellular and molecular level before we can begin to tackle the essence of brain function” (Wallis 2000).

However, what is not answered and what is even not understood as a problem is the basic epistemological question about the relation between the whole and its parts. How can there be an ‘upward causation’ from the behaviour of the parts to the behaviour of the whole system. The central issues of *logical typing* (chap. 3.2) and of *emergence* (chap. 4.10) are normally neither addressed nor understood.

Also the ‘top-down’ model, favoured in this thesis, has to account for how a ‘downward causation’ (how the whole might influence the parts) can be possible (chap. 4.8).

The knowledge of a functional circle (may it even be as complex as a simulated heart), does not imply knowledge about the whole system. The reaction of ‘wholes’ cannot be predicted by that (Bertalanffy 1968: 149-153). There is fundamental *unpredictability* (von Foerster/Bröcker 2002: 175-179) due to the circular (cybernetic) function of parts (chap 4.4). The behaviour of systems is not necessarily a consequence of the behaviour of parts.

Another limitation to computer simulations is the concept of an environment. The environment of a simulation is the knowledge and the theory of the scientist. Thus, computer simulation is still a reductionist method which only works a little faster. But it creates no real difference to the usual experimental setting.

Reductionist research excludes unpredictability by limiting the number of factors. As in reality factors are numerous, we have an artificial situation, true if and only if the factors behave in the way they are simulated, i.e., under stable conditions. Thus, the results are only true under the defined circumstances.

This shall be demonstrated with the following example: A friend of mine investigated the turnover of chylomicrones and LDL in rats. In the biological system he found a deviation of about  $\pm 2000\%$ . When he perfused the isolated liver the deviation between the experiments fell to about  $\pm 100\%$ . Working only with prepared hepatocytes he reduced the deviation to about  $\pm 25-50\%$  and with the standardized HEPATOMA cell-line to  $\pm 5-10\%$ . And even this deviation vanished when he was able to clone a liver cell. Then his results became identical (Retzek, private communication).

In normal life unexpected events might totally change the outcome of a process. For example, decision making is a complex procedure. It has been shown that short term effects and long term effects are cautiously considered and then a decision is made. Brain scanning indicates that the ventral and dorsal striatum is involved in this process (O'Doherty 2004). It also could be demonstrated that men and women tend to prefer long term benefits. However, if during the process of testing the men see a photography of a beautiful girl they throw all long term considerations over board and look only for a short term benefit, something not true for women if presented a photography of beautiful men (Wilson/Daly 2003). This is supported by another experiment that demonstrated that in short term decisions mainly parts of the limbic system associated with the midbrain dopamine system, including paralimbic cortex are involved. These centres are associated with the emotional aspects in decision making (McClure et al 2004).

These experiments shows that if only a small detail is changed in an otherwise stable setting the outcome differs fundamentally. It is probably known since humans exist that as soon as emotions come into play the results become in a way unpredictable. Somehow they spoil everything. In the daily practice all kind of emotions are involved which do not match the experimental setting. There are always unexpected developments. Such developments are normally called psychological or psychosomatic. But this is not correct. Unexpected behaviour arises all over and no computer simulation is able to foresee that.

This difference between reductionist setting and real life might explain the following case: The *Randomised Aldactone Evaluation Study* (RALES) demonstrated that spironolactone significantly improves outcomes in patients with severe heart failure. The publication of RALES was associated with abrupt increases in the rate of prescriptions for spironolactone. This had no beneficial effect, but led to an increased hyperkaliaemia-associated morbidity and mortality. (Juurlink et al 2004). The authors of the control study and of the related editorial (McMurray/O'Meara 2004) assumed that physicians had made mistakes (not observing risk factors properly, not controlling potassium levels often enough, etc). But may be this view is just too simplistic. In everyday life there might have been factors which just do not exist in the somehow reductionist setting of the hospital. The therapy might have increased rigidity (chap. 6.4). It also might have altered the 'information' of the drug (chap. 4.1). In such a case a rare event might lead to the breakdown of the whole system.

These reflections shall not serve as an exhaustive explanation of the difference between the reductionist setting and real life. Though, they might give an impression about the difficulties translating experimental results into practice. The fact as such is well known. But scientists often do not have the appropriate epistemology to explain the differences and the difficulties they encounter.



## b ) measurements without semantics

*Measure what is measurable.*

*Make measurable what is not measurable*  
attributed to **Galileo Galilei (1564-1642)**

*Everything that exists, exists in a quantity  
and can therefore be measured*

attributed to **Lord Kelvin (1824-1907)**  
(Watzlawick: 75)

*Know which abnormality you are going  
to follow during treatment.*

*Pick something you can measure*  
**C. Meador (1999)**

Precise measurement is a fundamental issue of our current science. It has many advantages. Investigations can be standardized, are comparable and reproducible. This has (or seems to have) a higher validity than philosophical or theological considerations that hardly are called scientific. Philosophy and probably systemic concepts are (or seem to be) too speculative. A solid measurement gives the feeling of security. It might even be called objective if the frame is exactly defined and certain ontological gaps (Bateson/Bateson 1988: 62-63) are silently overlooked. But it's the little things that always cause the problems. Whereas a measurement seems to be secure, its meaning isn't. It makes no sense to go to a pharmacy and measure the temperature of all the drugs and conclude on their effectiveness. (However, if temperature is over 80° C probably most drugs are ineffective.) Or the measurement of brain weight (that is less in women than in men) lead (a hundred years ago) to the assumption of a 'physiological debility of the female' (Möbius). There was a lot of reasoning when Möbius' book was published demonstrating a basic epistemological phenomenon: *the measurement might be objective, the interpretation is never.*

Today only few dare to maintain Möbius' findings (Shaw et al 2006), because gender differences have to be expressed more cautiously (Witleson et al 2005). But brain research has not changed its objectives. Size is still linked to certain characteristics and often seen as causal: intelligence is connected to the size of 24 regions known to be related to memory, attention and language (Pichler 2004), sex drive is attributed to the size of the amygdala (Baird et al 2003), depression to the hippocampal volume (Mac Masters/Kusunakar 2004) and ADHD to the size of the corpus callosum (Semrud-Clikeman et al.1994) or the basal ganglia (Qui et al. 2008). Current brain

research even found some consolation for the female: although they do not have the brain weight of males, they have more surface due to a greater gyrification in frontal and parietal regions, something said to be important for a good function (Luders et al 2004). Moreover, the enlargement of brain regions through genetical manipulation leads to a worse outcome in mice. That is, there is a kind of optimal size (Leingartner et al 2007) and we could argue that the female is more optimal than the male.

However, all these results make only sense when an underlying causal relation is assumed, the "truism 'structure defines function'" (Buzsáki 2007). But when seizure is an expression of function it would be more a consequence than a cause. And exactly this has been observed, too. Training alters brain's macroscopic structure and seizure (Draganski et al 2004) and brain plasticity remains prominent during the whole lifetime (Doidge 2007).

Seizure related causations also take for granted that different people have an identical structure and processing. Concerning intelligence, at least, there are indications that the male and the female use different strategies involving different parts of the brain (Haier et al 2005). That is, a measurement as such is meaningless. Its value depends on the underlying theory. The branch of logic dealing with this issue is called the *semantics* (chap. 3.1).

### **c) the autistic-undisciplined thinking in medicine**

The current way to process data and to create knowledge shall be demonstrated with the effects of wine onto health. It might serve as a blueprint for all kind of medical research. The advantage of this example is that it covers nearly all aspects of medical research. Simultaneously it inspires our fantasy more than other examples which will be discussed later. Moreover, the effect attributed to wine exceeds those of many other well-known therapies. Thus, this example is not only of theoretical value but ranks high in the practice of medicine.

Drinking moderately red wine prolongs life (Streppel et al 2009), has a protective effect for cardiovascular diseases, is helpful in chronic obstructive pulmonary disease (Culpitt et al 2003) and prevents stroke (Mukamal et al 2005). It even counters cardiovascular effects of smoking (Lekakis/Papamichael 2003) and of a fat diet, at least in mice (Baur et al 2006). May be this due to its content of Melatonin (Iriti et al 2006), or of *Resveratrol* which prolongs life in drosophila (Valenzano et al 2006) and shows certain protective effects against deafness (Coghlan 2006). Or it is due to the

suppression of endothelin-1 (Coder et al. 2006). Or it is due to its property to inhibit bacterial growth, especially of *Chlamydia pneumoniae* bacterium that some blame for clogged arteries and heart disease (Mahady 2004), although some contradict (European Society of Cardiology 2004). Or due to its natural antioxidants effective in pancreatic cancer cells (University of Rochester Medical Centre 2008). Or is it even due to the activation of Aldehyde Dehydrogenase-2 which reduces ischemic damage to the heart (Chen et al 2008b)

Red wine is also protective against prostate cancer, attributed to its content of flavonoids (Schoonen 2004). The red wine Cabernet Sauvignon (there is a lot of room to investigate the effect of different grapes) might lower the risk of Alzheimer's disease (Wang et al 2006).

But white wine (one to three glasses per day) improves the function of the lung (American Thoracic Society 2002) and is said to have an equal amount of bioactive substances to red wine (Falchi et al 2006). Wine in general has a protective effect on dementia (Truelsen et al 2002), boosts brainpower (Khamisi 2005) and non drinking is equally related to mild dementia as drinking large quantities (Anttila et al 2004). On the other side, beer might have anti-cancer (Arimoto-Kobayashi 2005) or anti-inflammatory effects (Winkler et al. 2006).

In the normal assumption of additivity it would be advisable to drink daily 1-2 glasses of red wine for heart and brain, 1-2 glasses of white wine for the lung, and a beer to provide cancer.

However, this is not advisable for everybody, as there seems to exist an increased risk for heart problems after the age of 55, when young people drink only small amounts of alcohol (Pearson 2004a). Furthermore, there are gender differences and women get more easily drunk by wine than men what is not true for beer (Zandonella 2001).

Whether this is the reason why they become more quickly pregnant through wine and not through beer and other sprits (Dobson, 2003b) is not clear. Moreover, women have a higher risk for breast cancer in drinking wine (Newcomb et al. 2009).

To solve the alcohol problem, there have been attempts to give the ingredients of wine in the form of a pill (Fox 2004). But this would only be possible if we knew what actually works. Some maintain that it is only the alcohol (Mukamal et al 2003).

Others even believe that the benefit of wine is a pure myth (Kröger 2003) and contribute its beneficial effects to the way of life that people with constant and moderate drinking live. By that the 'French paradox' (low coronary mortality

connected with high consumption of animal fats) has been explained. An example might be the oldest man in Greece. With 110 he drinks moderately alcohol, never stopped smoking, still walks alone if he has the possibility and never took any medicine (NET, Evening news, Greece, 9.1.04).

But things are even more complex. Even if wine or alcohol should have a protective effect for cardiovascular diseases it might be harmful as even small amounts impair the ability of driving what leads to more car accidents (Horne et al. 2003). The old people who 'benefited from wine' lived in a world with little traffic and might never have had a driving license.

So what about the following statement? "A drink a day keeps the doctor away from some of us, concludes a review by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) in the United States. But you need to ask your doctor if your level of drinking is healthy, it adds" (Pearson 2004b). What shall the physician answer? Is it reasonable to recommend the drinking of alcohol to non-drinkers (Goldberg 2003)? Despite of all discussions on the health protective potency, alcohol in practice is as harmful as smoking (Pearson 2004a) and many illegal drugs (Nutt et al 2007).

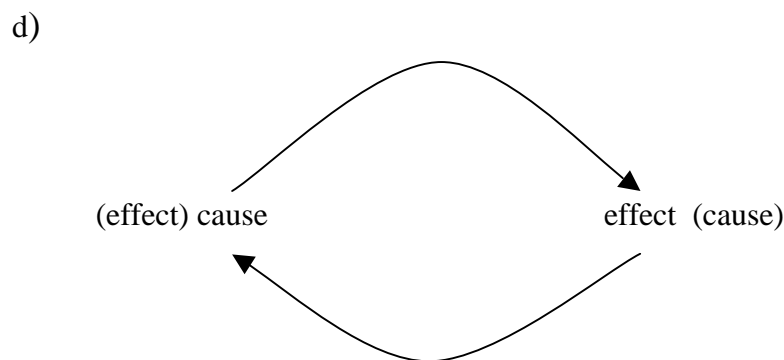
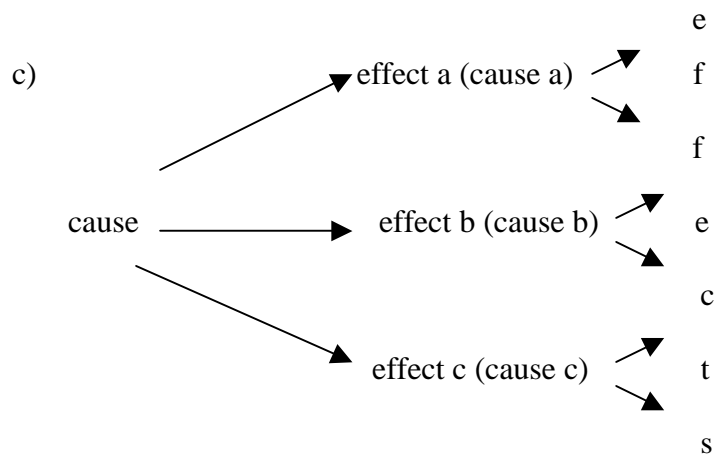
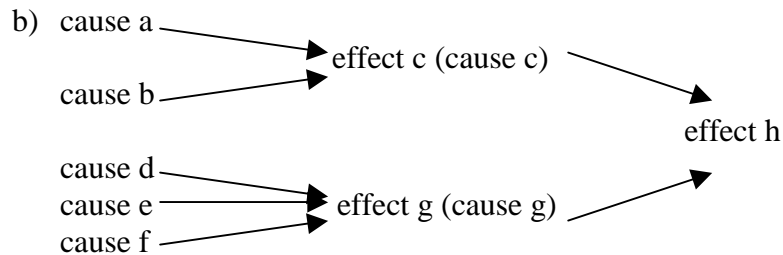
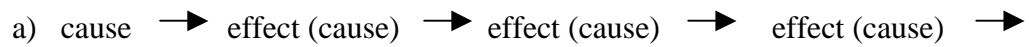
The attempt to reduce the side effects of drinking by identifying those who are genetically susceptible seems to be vanishing as until now 51 related genes have been found (Johnson et al 2006). But as these genes have been shown to be related to alcohol abuse in general and no differentiation between red wine, white wine, beer and liquors was made. May be there is a specific gene for red or white wine, or even Cabernet Sauvignon?

To mix up such insular findings creates the undisciplined pattern, so often to be found in the medical discourse. The autistic part is the ignorance of the level of abstraction. The example of alcohol and health involves at least 5 different logical levels. To correlate them needs a polycontextural model, a structure that enables us to decide on issues like truth and meaning (chap. 3.5).

#### **d) causal connections**

Reasoning based on unrelated findings, makes it possible to apply a simple concept of cause and effect. However, as soon as findings are embedded in a complex pattern the causal approach has disadvantages.

The following diagram shows some causal interactions as they are silently taken for granted in every medical research and practice (after Rosslenbroich 2001):



The diagrams a-c are normal *causal chains*. The prototype for diagram a is: ‘For a want of a nail a shoe was lost; for want of a shoe a horse was lost; for want of a horse a rider was lost; for want of a rider a battalion was lost; for want of a battalion a battle was lost; for want of a victory a kingdom was lost – all for want of a nail’ (Hanson 1972: 50). These kind of chains are well known in medicine. They are the rule in the description of diseases and consist of discrete physiological and pathological links

that can be measured, defined and proved. But it must not be forgotten that “experiments are *designed* to be as chain-like as possible” (Hanson 1972: 67).

They are true only in the experimental setting or in retrospective. Rarely a prognosis for the kingdom (health) is possible from a nail (bacterium or altered normal value).

Therefore mostly diagram *b* and *c* are applied:

In the winter 2003/2004 it was expected that about 50.000 people died in the UK of the consequences of cold weather, over 2500 in one week, more than in Russia. The deaths were mostly due to heart or breathing problems (Griffith 2003; Wilkinson et al 2004).

We have here a combination of diagram *c*:

- cold weather causes a lot of different reactional patterns in the human organism,

and diagram *b*:

- the immune system, the heart or the lungs must have been impaired by other processes, otherwise the cold would not have affected them.

Protagonists of a plain linear thinking (diagram *a*) might argue that colds and pneumonias are caused by viruses or bacteria and that the deaths are unrelated to the weather. Only a few cases, like a pensioner couple that froze to death because it had no more gas, could be seen as caused by cold. But this would be an extreme autistic point of view.

To avoid such consequences of cold weather different prophylactic and therapeutic measures could be proposed:

- vaccination
- warm cloths
- better social care
- better nutrition
- preventive and therapeutic antibiotics

However, in arguing that way, one is again caught in an undisciplined thinking.

Furthermore, all this does not explain why the mortality is higher in the UK with its mild winters, whereas it is lower in all other European countries, Scandinavia included (Wilkinson et al 2004).

As a first hypothesis, the higher mortality in the UK might be attributed to a lack of adaptation to cold weather. This includes recursive processes (diagram *d*) that are normally not used in medical modelling. Recursive processes will be formally

demonstrated later (chap 4.2). Also their implications for health in general and for the case of deaths due to cold in special (chap. 6.6). For the investigation of the causal relations it is sufficient to state that this type poses certain difficulties.

A simple example for a recursive process is: taking a cold shower in the morning has not the aim to lower body temperature that has been elevated while lying in the warm bed (what is not true). It is a stimulus that through recursive effects raises the temperature of the body and/or the skin (Schnitzer et al: 63-66). The problem with recursive processes is that they are nonlinear (doubling the time of the shower does not double the effect) and non-trivial (chap. 4.5). What is good for one person might be harmful for someone else. Even the same person will react differently at different times.

150 years ago Bernard solved the problem in defining a *milieu intérieur*, which is today also called autopoietic organisation (chap. 4.8). However, experimental settings mostly exclude recursive processes from the frame of observation. Actually, the absence of such feedback-mechanisms is essential for analytical studies (Ashby, 1960: 38). That is, circular processes are made linear and a causal chain is created such that trivial concepts of cause and effect are applicable.

Only rarely this procedure is absolutely impossible. One example is the administration of oxygen in asthmatics. Giving oxygen in an asthmatic state might be beneficial or harmful. Beneficial, because oxygen is needed; harmful because the breathing centre is adapted to low oxygen – levels, such that the administration of oxygen leads to reduced breathing. The results of such a therapy are confusing and, therefore, controversially discussed (Bateman/Leach 1998, Chien et al 2000, Jain/Corbridge 2001, Fujimoto et al 2002).

A further difficulty in the causal concepts is the mostly overlooked fact that a cause is not a measurable item. It is a hypothesis, a 'statement linking together two descriptive statements' (Bateson, 1981: 39). Causal relations are always a concept of an observer according to his interests and theories. "Causation is of the observer, not of the observed" (von Foerster, 1995: xv). Therefore, "causes are certainly connected with effects; but this is because our theories connect them, not because the world is held together by cosmic glue" (Hanson 1972: 64). Or in other words: "There are as many causes of x as there are explanations of x" (Hanson 1972: 54). That is, causal attributions are "theory-loaden from beginning to end" (Hanson 1972: 54). Already Bernard was very critical about this procedure: "...the question 'why'..is really

absurd, because it necessarily involves a naïve or ridiculous answer. So we had better recognize that we do not know; and that the limits of our knowledge are precisely here” (Bernard: 80).

Reductionist science ‘solves’ the problem by creating a stable frame under which an observation becomes reliable for a certain observer. As all other relations are excluded, the effect of one intervention into a system can be observed and described in a measurable (digital) way. But what is the cause in such a setting? Is it the specific intervention or is it the setting that holds other factors stable. The behaviour of the scientist could be seen as the cause, as well. If someone who can swim is bound and is thrown into the water, what is the cause of his drowning?

“In nature, unlike the laboratory, physical conditions are rarely held constant whilst certain factors are allowed to vary for the benefit of a well-placed observer.....Suppose that conditions in nature were held constant. The chain analogy would still be artificial, since it would not indicate how the explanation of events came about nor in what this explanation consisted” (Hanson 1972: 68).

Causal attributions are highly artificial. Moreover, they are too often based on obviousness<sup>3</sup>, or other silent assumptions. One is that the organism or human will react similarly under changing conditions or that things will continue to happen as observed, for example that a beta blocker will induce the same changes every day. This theory is called *inductionism* and represents one of the foundations of current medical science. The problem of inductionism has been discussed extensively the last decades (Vickers 2006). Popper (1972) had been its main critic. The problem with inductionism shall be demonstrated by an example of Russell: A chicken observes that every morning the farmer will bring food. It is able to rely on this process. Then there are even days when the farmer brings more food (it must have been before a holiday). But one nice day the farmer comes and brings no food, but cuts off the head of the chicken (Deutsch 2000: 64). That is, not understanding the (semantic) context of an observation gives rise to numerous surprises which in medicine are sometimes called adverse reactions type B (chap. 4.1).

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<sup>3</sup> Vollmer (1994: 107) describes the procedure as follows:

1. Something is called as self-evident, obvious or clear (*intuition*).
2. Someone is cited saying the same (*authority*).
3. It is referred to as consensus in this question (*majority*).
4. It is repeated until it is believed (*adaptation*).



Due to its limitations the concept of cause underwent a lot of changes during the centuries and modern epidemiologists became quite cautious about it (Lawlor et al 2004).

A short overview reads like this:

“ David Hume refers to causation as --ie, the notion that it is the causal relation which connects entities of this world to events they produce. A cause may be called necessary when it must always precede an effect, and without it, there would be no effect; a cause is deemed sufficient if it inevitably produces disease. An individual cause can be necessary, sufficient, neither, or both. Furthermore, causality may be deterministic, an exceptionless connection between events, or probabilistic, providing only a probability value for the occurrence of an event. In medicine, specific criteria have been suggested and reviewed for their adequacy as a guide to when a causal relation has been demonstrated. These include: a dose-response effect, typically considered a major criterion of causality, which may not be met or may be due to confounding factors; consistency in replication in alternative settings or methods; strength of association; temporal relation, the cause should precede the effect; biological plausibility, or mechanism; and compatibility with existing knowledge” (Holberg/Halonen 2003)

In short: Causality can be defined in two main ways. One possibility is to say ‘if A had not occurred, then B would not have occurred.’ Moreover, to say that A is the cause of B is to say that there is a chain of causally dependent events linking A with B. This is true for laboratory research where factors can be held stable. But this is not the reality of general medicine. Therefore a probabilistic causality became necessary. “The basic idea of the probabilistic approaches to causation is that a cause is an event A, the occurrence of which makes the occurrence of another event, B, more likely than if A had not occurred.” (Hulswit 2004).

Today causality is seen as given by

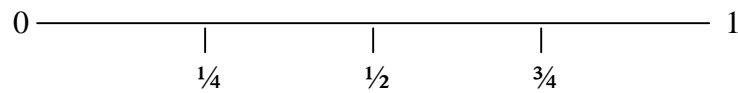
- experimental circumstances (Francis Bacon, 17<sup>th</sup> century),
- often repeated observation (David Hume, 18<sup>th</sup> century),
- comparison (John Stuart Mill, 19<sup>th</sup> century),
- randomising (Ronald Fisher, 20<sup>th</sup> century).

Translated into medical practice this says that the efficacy of a therapy can only be proved under the following conditions

- a study (experimental circumstances),
- a cohort (repeated observation a many patients),
- a control group (comparison),
- an accidental assignment to a class (randomisation)

(Kienle et al 2003).

All this is well known and the very basis of modern medicine. The epistemological difficulty is the following: Probabilities are probable values that can be located on a straight of probabilities (Günther, 1976: 264-266).



Instead of a radical opposition between positive and negative there is a gradual transition from one to the other. The line describes a span of: ‘This is false – this is more false than true – this is more true than false – this is true’; or better: ‘this is known as false – this is known as more false than true – this is known as more true than false – this is known to be true’ (Günther, 1979: 36).

However, probabilistic logic contradicts the absolute fundament of Aristotelian logic, the Trinitarian axiom. This axiom consists of the sentence of identity, the sentence of forbidden contradiction and the sentence of the excluded third, the *tertium non datur* (Günther, 1976: 34). It says that something is or is not and a third is not allowed. Some maintain that the laws of probability are only an extension of Aristotelian logic to conditions of uncertainty (Jaynes/Bretthorst). But this is not the case. This point of view mixes up two issues: the condition of the observed and the condition of the observer.

The additional values between 0 and 1 have no real relation to objectives (Günther, 1979: 184-185). The probabilities reflect the epistemological condition of the observer, not any reality. For example, “the census bureau will tell you that the typical American family has 2.1 children, but there are no families (we hope) that precisely match this mean” (Newman/Weissamn 2006). Also a patient tested HIV positive has a certain probability to be infected (between 50% and 99% according to risk-patterns – chap. 2.7). But the patient is either infected with the HIV virus or not. It is the observer who assigns a probabilistic risk as he has no other option.

### e) deficient maps

Another inconsistency in the logical context of today's medical thinking is that descriptions are regarded as truth. In epistemology this has been described as confusing the map and the territory (chap. 3.8). Descriptions of a disease according to certain criteria (for example pathophysiology) are but maps for an unknown territory (sick patient) established according to a legend (basic theory). This process of mapping is necessarily insufficient as a map is never able to represent the complexity of a territory. That is, a diagnosis is often not appropriate to describe what the physician really encounters. Actually, many a practitioner is happy, if (s)he sometimes sees a patient resembling the definitions. The specialist sees more typical cases, but also more where the concepts do not seem to fit either. This shall be demonstrated with arthritis.

"Anyone who has seen half a dozen examples of common lupus and lupus erythematosus is able with ease to distinguish one from the other..., but let him wait awhile and see more, and he will find before long that there are examples of mixed forms of the disease which it is impossible to denote correctly without employing hybrid names."

Jonathan Hutchinson, F.R.C.S.,  
*British Journal* May 1880 (Kelly et  
la: 1115)

What is true for lupus erythematosous, one of the main forms of arthritis, is true for all kinds of arthritis. The most common form is rheumatoid arthritis (RA) which is today diagnosed according to the American Rheumatism Association (ARA criteria). There are older and the newer criteria:

*older ARA criteria for Rheumatoid Arthritis*

- 1. Morning stiffness**
- 2. Pain on motion or tenderness in at least one joint**
- 3. Swelling of one joint, representing soft tissue or fluid**
- 4. Swelling of at least one other joint (soft tissue or fluid) with an interval no longer than three months**
- 5. Symmetrically joint swelling**
- 6. Rheumatoid nodules**
- 7. Typical radiographic changes**
- 8. Serum rheumatoid factor**
- 9. Characteristic synovial fluid**
- 10. Synovial histopathology consistent with RA**
- 11. Characteristic histiopathology of rheumatoid nodules**

Classic RA – 7 criteria needed  
Definite RA – 5 criteria needed  
Probable RA – 3 criteria needed

*ARA criteria for rheumatoid Arthritis 1987*

- 1. Morning stiffness**
- 2. Arthritis of 3 or more joint areas**
- 3. Arthritis of hand joints**
- 4. Symmetric arthritis**
- 5. Rheumatoid nodules**
- 6. Serum rheumatoid factor**
- 7. Radiographic changes**

A patient is said to have RA if he or she satisfied at least 4 of the following 7 criteria. Criteria 1 through 4 must have been present for at least 6 weeks. Patients with 2 clinical diagnoses are not excluded. Designation as classic, definite, or probable RA is not to be made.

Although such criteria are helpful in

establishing a diagnosis their value should not be overestimated. It is easy to diagnose the disease if many criteria are present. But then no criteria are necessary. In early stages, where the diagnosis and the differential diagnosis to other forms of arthritis is often difficult, the older criteria spoke of ‘probable’ RA. Newer criteria either diagnose RA or not. But they do not exclude RA if only a few criteria are present. From a theoretical point of view this is an interesting situation: RA in an early stage is difficult to be distinguished from other forms of arthritis and has also a good tendency for a total remission. The question is what we understand under ‘having RA’. Is it possible to have a disease without a clear diagnosis? Is it an undetected disease? Or is it no disease yet? Actually, every answer depends on the criteria of the observer and “one of the most significant determinants of prognosis in RA may be which criteria....are used to establish diagnosis” (Kelly et al: 917).

This lack of security on a large scale is typical for the medical profession. The problem arises, when our models are taken for real, when the map is taken for the territory. The distinction disease – no disease is only a guideline and creates no truth. Of course, such logical subtleties are of no importance in an outbreak of cholera in a refugee camp. But they have a lot of consequences under other conditions.

In arthritis things are complicated by the fact that each of the ‘diseases’ RA, systemic lupus erythematosus and sclerodermia have a different pathomechanisms and their own criteria to diagnose them, but they can only to be diagnosed and distinguished from each other when they are clearly expressed. Furthermore, there are so called overlap syndromes, containing characteristics of two or three forms. One of these overlap syndromes is today called *mixed connective tissue disease* (MCTD) diagnosed according to clinical manifestation and biochemical findings. But, again, such a distinction is more a rule of thumb than a logical category.

Of course, there have been attempts to define rheumatic diseases through pathophysiological mechanisms, by certain antibodies, rheuma factors, etc. But no attempt leads to clear results. Genetics suggest that different genes play a role in the development of rheumatic disease (Morel 2004). One gene called *RUNX1* involved in the development of blood cells and playing a regulatory role in the immune system, has been connected to different forms of arthritis such as RA (Tokuhiro et al 2003), psoriatic arthritis (Helms et al 2003) and lupus erythematosus (Prokunina et al 2003). The same ‘causal relation’ between a gene and RA and Lupus seems to be true for the *STAT4* – gene (Remmers et al 2007). Another gene (*MHC2TA*) is connected not only with RA but also with multiple sclerosis and myocardial infarction (Swanberg et al 2005). So even on a genetical level rheumatic disease seems to be a manifold expression of a basic process.

It is known that the imbalance of Th1 and Th2 helper cells play a crucial role in the genesis of rheumatic diseases. A type1 imbalance with a predominance of Th1 cells corresponds with RA and a type 2 imbalance with a predominance of Th2 cells corresponds to systemic lupus erythematosus (Kreutzfeldt/Müller 2001). That is, the different types of imbalance might lead sometimes to different, sometimes to similar clinical expression. In this sense arthritis would just be a certain morphological pattern of a more general imbalance, a network pathology (chap. 6.2, 6.7).

“Diagnosis in the rheumatic disease has been overemphasized. On the one hand, current classifications contain patients with features of several diagnostic entities,

often termed 'overlap' patients, with no absolute diagnosis possible. On the other hand, patients with the same diagnosis often should be managed very differently. Modern management individualizes therapy with diagnostic categories, based upon subgroups of patients with differing prognoses and therapeutic requirements.....Management in rheumatic disease is more closely linked to the underlying pathophysiological process than to the specific entity....Even such a basic concept as 'inflammation' has different therapeutic implications, depending upon underlying pathophysiology" (Kelly et al: 361).

That is, the classical approach of diagnosing is a restricted tool in order to develop an individual strategy which has to take many factors into account.

The American Rheumatic Association does therefore not provide a definite map for a definite disease. It standardizes only one way to classify morphological and pathophysiological changes. To some extent this is true for most of our diagnoses.

A diagnosis might be of doubtful value in the daily experience of the physician. He is always trapped between two extremes. One extreme is to understand the patient in all of his individual expressions, the other is to come to a clear and precise conclusion.

This problem became more obvious since physicians in many countries are obliged to define their diagnosis according to the *International Classification of Diseases (ICD)* – key. Working with the ICD – key, it is often difficult. Sometimes it is even impossible to assign a patient to a given diagnosis.

The new key, the ICD-10, currently introduced in most industrialized countries, is said to solve this and other disadvantages. The new key shall provide a greater specificity. It also abandoned the notion of disease and replaced it through 'disorder'. Through a phenomenological nature it would have had the advantage to be closer to the clinical practice. But ICD-10 tries the impossible. It strives for an operational diagnosis with a phenomenological description. This is a logical impossibility or it requires a polyvalent logic (chap. 3.5) with a totally different structure of thinking. It is impossible to be specific and relational at the same time. The dilemma is not solvable in the given epistemological frame. So ICD-10 does not hold what it promises (Küchenhoff 2001). It cannot. Therefore it treads the usual paths by counting criteria, something that is neither specific (as it does not refer to pathophysiological mechanisms) nor relational.

The crux in establishing a clear-cut diagnosis can be seen with the diagnostic manuals of psychiatric diseases. It underwent the change from the extreme of an unspecific

description (not able to provide comparable diagnosis) to the extreme of a clearly classifying system. After WWII the catalogue of American Veteran's Administration (the forerunner) listed 26 mental disorders. Too few to describe all the different mental alterations seen in practice. Its follower the Diagnostic and Statistical Manual of Mental Disorders (DSM) listed more diseases with every new edition. But still before the third edition, DSM III, 1980, "a patient categorized as schizophrenic in New York would take on a diagnosis of affective disorder upon flying to London" (Helmuth 2003).

This has changed totally with DSM IV which lists 395 disorders with decisive, countable criteria. Everywhere in the world it is now possible to come to the same diagnosis for the same patient. And all diseases are clearly distinguished. "Anxiety and depression had become as different as chalk and cheese" (Shorter/Tyrer 2003).

But, as it could be expected, this did not solve the problem. The map might be very strict. The patient isn't. Therefore it is no wonder that 20 to 50% of patients fall short of DSM IV criteria and get thrown into the *nos (not otherwise specified)* category (Helmuth 2003). This means that these people are classified as ill, but cannot be diagnosed correctly. According to the principles of evidence based medicine there is no evidence at all for their treatment. This is hardly acceptable in a strict scientific thinking.

But the price for decisive diagnostic criteria is even higher. Adding up all the epidemiological occurrences for mental disorders according to DSM IV, in Germany about 58% of the population is suffering of a disturbance of personality (Blech 2003). Nearly nobody is left as healthy. Everybody has an abnormality, making it difficult to find "the last well person" (Hadler 2004). In fact, "medical research has made such progress, that there are practically no healthy people any more" as Aldous Huxley shall have said.

The reason is probably not only that half of the authors of DSM IV had a commercial conflict of interests (Cosgrove et al 2006). It has also to do with an incertitude about the nature of a diagnosis (Ghaemi 2009). For the moment it is sufficient to state that

the DSM and the ICD-key just standardize the use of certain terms according to criteria, given by committees. They do not create a reality.<sup>4</sup>

The ‘chronic fatigue syndrome’ might serve as an example for the difficulty with the reality of a diagnosis. We all have seen such cases with chronic fatigue, most of us more than of tuberculosis. It is futile to discuss, whether a disease *really* exists (Raine et al 2004), after some criteria are defined. Of course it exists, as it has been diagnosed according to criteria. It does not matter that there are no pathophysiological ‘causes’ for the disease (White 2004), as a lot of other diseases, as most cases of hypertension have no other cause either, except of certain criteria. The ‘advantage’ of hypertension is that there are, at least, some altered reference values. ‘Existence’ is not the issue. Karl Krauss shall have said: “The main disease is the diagnosis”. And this is 100% true when the map is taken for the territory.<sup>5</sup>

In older times many diseases have been called essential or functional. But this always has provoked the anger of physiologists. “No longer able to find an anatomical relation, men said then, that the disease was essential, i.e., without any lesion; which is absurd, for it amounts to acknowledge an effect without cause” (Bernard: 113).

This is a crucial point in the understanding of epistemology. If a linear, causal approach is chosen then there has to be something to cause an alteration, a disease. Without such a definable cause things seem to become unsound. Therefore, the ‘functional somatic syndromes’ are ‘not medically explainable’ states (Henningsen et al 2007). That is, the disease seems to be uncaused. It does not help to call it psychosomatic, as this is only wording where a fictive cause for an otherwise unexplained state is postulated (chap. 2.3).

However, functional problems exist. Autoimmune diseases are a result of impaired functions. So even anatomical lesions and physiological alterations might be nothing else than an expression of an imbalance. But the current medical paradigm of cause and measurement does not provide a suitable tool to understand these processes. Imbalance is not a measurable item. This is why current diagnosis is more based on criteria than on function.

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<sup>4</sup> The question how self-created criteria induce a ‘truth’ has been investigated by the ‘Deflatory Theory’ (Stoljar/Damnjanovic 2007).

<sup>5</sup> In how far a diagnosis is just an intervention will be discussed later (chap. 4.6).



## **f) generalisation and individualisation**

There is an underlying conflict in all diagnostical and therapeutical process which has been called the opposite between generalisation and individualisation. The last 150 years there has been a tendency towards generalisation. Diseases are defined by general characteristics. Individual aspects are mainly neglected. The concept of therapy follows a regimen that has proved to be beneficial for populations. The individual case is not sufficiently taken into account. The NNT, the ‘number needed to treat’, describes how many patients have to be treated in order that one patient benefits of the treatment. “NNTs under 5 are unusual, whereas NNTs over 20 are common” (Smith 2003e). Therefore, it become more and more necessary to understand, what really helps the individual and not a population.

Today’s individualisation is called *tailored therapy*. Tailored in this sense means that a therapy should be based on the patients responsiveness. That is, the individual reaction of the patient as a whole has to be considered. There had been a certain hope that genetical testing will enable us to sort out susceptible patients. But this hope quickly dwindled away (Judson 2008).

Methods which tried to influence inner regulation (chap. 6.3), like psychotherapy or balneology always individualised and tailored their therapies. Their observations suggest that a broader view of the individual and his abilities is necessary. In order to attain a certain goal, equifinal processes (chap. 4.7) can and have to be activated. The unique situation of a patient has to be understood. Pierre Schmidt, a famous homeopath, has been asked by a patient, whether he had seen already a similar case as hers. He answered: “I hope not”. This is in a nutshell the basis of individualisation. For individualising methods the diagnosis is less important. Some methods even do not have a diagnosis, respectively, as in homeopathy, the diagnosis is synonymous with the therapeutical strategy (translated into orthodox medicine: a methotrexate-case).

This opposite of generalisation and individualisation has been formulated and discussed in many different ways, stressing always a different aspect:

- cohort vs. individual observation
- interest in the disease vs. interest in the person
- cause vs. appearance

or for psychotherapy (Fiedler 2001)

- diagnose-orientated application of a method vs. individual, person-orientated psychotherapy

- deficit based concepts vs. support of resources
- therapeutical technique vs. therapeutical relationship

The underlying problem shall be demonstrated with a study which investigated the effects of the firmness of a mattress on the clinical course of low back pain. The problem might sound to be of secondary importance, at first. But whoever listened to patients with chronic low back pain knows that it often is an issue that decides on the well-being of the patient, his fitness for work, the family climate and the happiness of everybody. Kovacs et al. performed a randomised, double-blind, controlled, multicentre trial. The study was carried out for 90 days. It found that patients “with medium-firm mattresses had better outcomes for pain in bed (odds ratio 2.36 [95% CI 1.13-4.93]), pain on rising (1.93 [0.97-3.86]), and disability (2.10 [1.24-3.56]) than did patients with firm mattresses. Throughout the study period, patients with medium-firm mattresses also had less daytime low-back pain ( $p=0.059$ ), pain while lying in bed ( $p=0.064$ ), and pain on rising ( $p=0.008$ ) than did patients with firm mattresses” (Kovacs et al 2003). But up to 10 % in the group with a medium-firm mattress had more pain.

This result produces a methodological problem. If everybody is advised to sleep on a medium-firm mattress, 10 % might have more pain. Such a schematic procedure would be no good medicine. Therefore the physician will have to ask the patient about his experience and change the therapeutic means according to the actual observations. But then all kind of other issues (the theory of the physician and the patient, the climate of the communication and many other aspects) will play a role. This creates a fundamentally different situation than that of a blinded trial. Thus medical practice becomes always individual.

Even surgeons who want to see patients only in narcosis individualize with every movement. Or in rescue medicine where patients are seen in coma or under circumstance where they cannot communicate, individualisation is absolutely necessary. Did the patient take drugs or medicine? Does he suffer from a chronic illness? That is, also therapy in emergency is individual. One of the first principles I learned in the education in rescue medicine was: ‘Forget the equation 1 patient = 1 ampoule. Give a dose you think is necessary for this special patient (age, weight, seriousness, hypothesis of the problem). Then look at the reaction. Repeat or change the treatment according to the observation. Being too courageous harms. Being too reserved harms.’ Everybody who worked in rescue medicine knows the highly beneficial effects of a correct, individual action and the disastrous effects of

schematic, non individualizing approach. Knowledge is important. But it is only a guide line. Rescue medicine is based on the individual decision of an individual doctor seeing an individual patient in an unique situation.

Rescue medicine is but a burning glass of all medical action. Every therapy has to be conducted in taking the patient's resources and reactions into account. A schematic procedure is mostly harmful, at least for a certain part of the patients. Therefore the claim of an acupuncturist, never to treat two people the same way (Worsley 1982: 23) is equally true for general medicine. However, in chronic diseases the processes are slower and the patient has more reserves to resist certain faults of a schematic therapy. In acute cases the physician understands quickly whether his treatment is beneficial or not. In chronic diseases this is much more difficult. A tool which might be helpful to understand how a therapy develops might be found in the concept of biological hierarchies (chap. 6.12, appendix VI).

#### **g) the practitioner's paradox**

The practitioner has to individualize in his daily practice. However, he has never been educated to do this. He has anatomical, physiological and biochemical knowledge, knows some typical states of disease, knows about probabilities and is confronted with a single human being onto which he has to apply this knowledge.

“Evidence-based medicine relies... on randomised clinical trials that emphasise efficacy: how an intervention works in a well-defined setting for a specific group of patients with a distinct disease. This information is insufficient to assist most doctors, because they have to treat less clearcut illness in indistinct patients' groups” (Maesemeer et al, 2003). But also in clear-cut diseases decisions are often made in an area of uncertainty (Chalmers 2004; Kirk et al 2004).

Guidelines cannot be based on data alone; judgment is unavoidable (Raine et al 2004), provisional hypothesis are tested (Griffiths et al 2005) and evidence plays only a partly role (Burgers/van Everdingen 2004). Actually, there is no individual evidence and the question “But does it work doctor?” (Protheroe 2003) cannot be answered sincerely.

Due to the lack of security, there is a tendency to involve patients into the process of deciding. He should be better informed, prescriptions should be made in partnership (Heath 2003; Evans et al. 2006), the probabilities and risks should be explained to him (cf. main topic of British Medical Journal 2003c), giving him a discrete choice (Ryan

2004), where the probabilities of different approaches (e.g., medical - versus invasive) are discussed according to the values of the patient (Montori et al 2005). Even “expressing uncertainty” should be a task of the doctor (Say/Thomson, 2003; Maesemeer et al, 2003).

But this is a risky path. Often the physician has not developed suitable strategies to communicate risks (Alaszewski 2005) and nothing can be said on the prospects of the single patient, especially in multi-disease or with different risk factors (Kamps 2003). However, patients have normally a quite good ability to assess risks and come to conclusions that are in line with their personal situation (Illife/Manthrope 2003). They are not educated in reductionist thinking and might have a better ability to feel and estimate complexity, something especially true for important decisions with long term consequences.

But also the physician, notably the practitioner has developed a method of observation and understanding which I would like to call *medical knowledge*, in contrast to the scientific-analytical knowledge. Already Bernard stated: “We should first of all state the medical problem as given by observation of the disease, then try to find the physiological explanation, by experimentally analyzing the pathological phenomena. But in this analysis, medical observation must never disappear or be lost sight of; it must remain as constant basis or common ground of all our studies and explanations” (Bernard: 199). Medical knowledge in this sense is not scientifically organized, but essentially based on experience and intuition (chap. 4.9). This discrepancy between the scientific and the empirical approach is not a characteristic of current medicine. Already about 2000 years ago Celsus (about 25 BC – 50) formulated the difference between a theoretical and an empirical medicine (appendix II). It is striking that the logic of the arguments has not changed since. Although the subject of research in theoretical medicine has moved from basic anatomical and physiological issues to subtle forms of physiological control there is no structural change in the arguments. On the side of the empirical medicine, the arguments have changed even less.

It seems that there is no possibility to avoid this gap of uncertainty between theory and practice. Medicine *is* the practitioner’s paradox. A systemic approach might be able to moderate this discrepancy by providing appropriate scientific tools. But this will not end the uncertainty due to the non-trivial status of human conditions.

## 2.2 Perception and Intervention

*A physician thinks to act, not to understand*  
König/Wancura, 1983: 25

Normally only neurophysiologists and philosophers are interested in the principles of cognition. But the basic mechanisms of cognition are also relevant for the medical practice. The reason is that all human communication, be it in social affairs or in medical practice follow the same pattern as found in the basic forms of perception. Thus, it is important to have a general idea of cognition before going into the details of medical practice.

We all have the natural feeling to perceive an outer objective world. But, as we know, nothing could be more wrong than that. Perception and cognition are not that simple. There is no projection of an outer world into our brains as the old neurophysiology suggested.

The fact that things are not the way we believe them to be has been a major topic in different sciences. Especially in physics exists a clear concept of how the process of observing influences the outcome. For medicine a comparable theory of perception has never been formulated. It still prevails a kind of naive naturalism maintaining that health, disease and therapeutic interventions can be judged objectively. In this chapter I will review some facts contradicting this position. Two points, although not necessarily always addressed, will be central. First, perception is theory driven from the very beginning and, second, there is always an unobserved field, an unrealised blind spot (more details in chap. 3.3).

Some fundamental principles in cognition are:

- Things are not perceived distinctively. The difference between figure and ground is not found in the basic physiological process (Grill-Spector/Nancy Kanwisher 2005). For medicine this implies, among others, that a disease (figure) is not something different than the ground (patient) but a method to organize complexity and to give meaning to the perceived.
- On the neurophysiological level there is no difference between perception and action (Dassonville/Bala 2004). Also this is nothing new and has already been proved some decades ago for social cognition, for the development of language and for social behaviour (chap. 4.2). For medicine it means that action shapes perception and vice versa. Some of the implications of this fact will be discussed below.

- Cognition is theory bound. Inherent theories are necessary to organize the multitude of incoming data. For the neurophysiological level here three deliberate examples:
  - To interpret the complex and ambiguous input, the human visual system uses prior knowledge or assumptions about the world. A 'light-from-above' prior is used to extract information about shape from shading and is modified in response to active experience with the scene. This prior is constantly adapted by interactive experience with the environment (Adams et al 2004)
  - Geometric illusions are perceived by a kind of probabilistic guess according to the individual experience (Howe&Purves, 2005).
  - After Sacks had lost the inner representation of his leg (see below) he had the illusion of falling when he stood on his two legs. Although standing upright, he perceived how he fell, obviously because in his inner theory only one leg existed (Sacks 1984: 140).

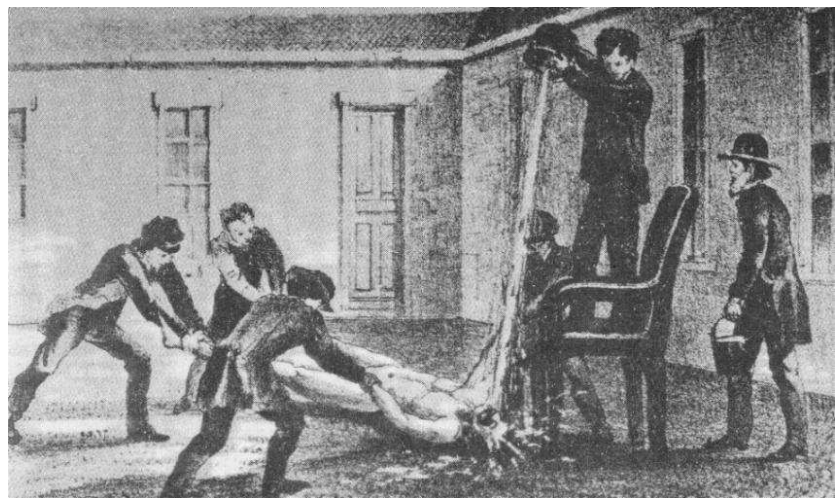
Inner theories organize complex and social cognition and behaviour. In family therapy they are called myths (chap 5.2). Intercultural studies show, how the feeling that things 'are as they are' often betray. The inadequacy of social concepts is, however, only noticed when things do not go well and the others do not behave as expected (Ivanovas 2002). In science this is called an 'anomaly' and occurs when an observation contradicts the paradigm (chap. 3.10). Theories and myths also organize medical cognition and give simultaneously the impression of objectivity. Thus, the perception and description of a situation is strongly connected to the basic values of the observer.

This shall be demonstrated by two psychiatric cases. The first text by Alice Miller, a known psychoanalyst, demonstrates Celsus' 'theoretical approach'. We learn a lot more about Miller's theory – a classical psychoanalytic approach – than about the patient.

"A patient from an African family grew up alone with his mother after his father had died while he was still a very small boy. His mother insists on certain conventions and does not allow the child to be aware of his narcissistic and libidinal needs in any way, let alone express them. On the other hand, she regularly massages his penis until puberty, ostensibly on medical advice. As an adult her son leaves his mother and her world and marries an attractive European with quite a different background. Is it due to chance or to his unerring instinct that this woman not only torments and humiliates him but also undermines his confidence to an extreme degree, and that he is quite unable to stand up to her or leave her? This sadomasochistic marriage, like the other example, represents an attempt to break away from the parents' social system with the help of another one. The patient was certainly able to free himself from the mother of his adolescence, but he remained emotionally tied to the Oedipal and pre-Oedipal mother whose role was taken over by his wife as long as he was not able to

experience the feelings from that period. In his analysis he encountered his original ambivalence. It was terribly painful for him to realize the extent to which he had needed his mother as a child and at the same time had felt abused in his helplessness; how much he had loved her, hated her, and been entirely at her mercy. The patient experienced these feelings after four years of analysis, with the result that he no longer needed his wife's perversions and could separate from her. At the same time he was able to see her far more realistically, including her positive sides" (Miller A: 61).

The other example is an account by Hahnemann. He treated a psychotic patient in 1792 (published 1796), to a time when mentally ill people were still held in chains, tortured and shown to the public. It was two years before Pinel in the Salpêtrière released the psychiatric patients from their chains, marking the beginning of a different psychiatric care. Actually, it lasted another hundred years until this approach was more generally accepted (Kraepelin 1962).



Psychiatric therapy in the 19<sup>th</sup> century

Psychiatry in the 19<sup>th</sup> century with amusing audience

That Hahnemann had a totally different idea of diagnosis and therapy can be already seen in how he described his patient:

We will only give selections from the most striking parts relating to mental science, especially such as give the reader an idea of the gifted and comprehensive mind now distorted by the violence of the disease, but which, disordered as it was, yet aroused admiration.

Hahnemann devoted the first weeks to observation only, without giving any medical treatment to his patient. The latter spent day and night having a series of attacks; at one minute he spoke as a judge and delivered sentence; at another, he would recite as Agamemnon, or as Hector in the actual words of the Iliad, sung in the middle of a stanza of Pergolese's Stabat Mater; or he quoted passages from the Old Testament in the original Hebrew, or sought for an old Greek melody to a song of Anacreon or the Anthology; and again changed over to passages from Milton's "Paradise Lost" or Dante's "Inferno"; and from these again he would turn to algebraic formulae. Nothing was ever quite completed, but the new idea displaced the former with violent haste.

"The marvellous part," says Dr. Hahnemann, "was the correctness of expression of all that his memory recalled from writings in many languages, especially of all that he had acquired in his youth." This mixture bears testimony to his extraordinary and manifold knowledge, but perhaps also to his eager desire to be brought into prominence by it, as he did when he boasted of his intimate acquaintance with distinguished personages; he was not free from this characteristic in his normal state. He smashed everything that came to hand at that period, even his piano, and this he put together again in a peculiar manner in order, as he said, to find a complementary note, the Proslambanomenon. This man, who ordinarily knew nothing of bodily ailments, once wrote out for himself a prescription to be immediately dispensed, the rare ingredients of which, according to Hahnemann's deposition, were so well chosen and arranged, and so correctly calculated for the treatment of a maniac of his type, that it could easily have been accepted as the work of a learned physician; had it not been that the absurd signature and directions for administering it were proof of a disordered mind. By what means did the spirit in the midst of the fog of a storm-tossed imagination, without chart or rudder, find its way to so excellent a remedy for insanity, and one unknown to many a doctor, seeing that he had no books in his possession? How did he manage to prescribe it for himself in the most appropriate form and dose? Almost as astonishing was the fact that during the worst period of his mental disorder, on being questioned, he would not only know the date (this perhaps was comprehensible, although he had no calendar) but also the correct hour by day or night with great exactitude. As he began to improve, this power of divination became more uncertain and unreliable until with the complete return of his reason he knew neither more nor less about it than an ordinary person. When he was completely cured, I pressed him once in a friendly way to solve this riddle for me, or at least to describe the sensation that had prompted him. "My whole body shudders," he replied, "and something cold runs over me when I try to think of it; I pray you not to remind me of this thing . . ."

At the beginning of his recovery he had a ravenous appetite (ten pounds of bread a day besides other food did not satisfy him); at the same time he showed a tendency to deceive and offend everybody, and yet when well again he ate moderately and behaved courteously to everyone – these are symptoms previously observed in similar patients.

(Haehl 2, 1922: 34)



Hahnemann was a representative of the *romantic medicine* which believed in the individual value of man. Thus, he had a phenomenological approach. The individual value of man had been no issue for the medical thinking before romanticism. And somehow it has been no issue for medical thinking later. As a consequence, medical literature has never been concerned with detailed and individual descriptions of psychotic processes. This was more a subject for artists.

Maybe the best account of a psychotic state is the autobiography of John Perceval (Bateson, 1974). He describes the development, the crisis and the recovery of his psychosis in 1830-1832 so precisely that his account helps to get a clearer concept of the disease in special, and of perception and brain function in general. He describes how the behaviour of the environment maintained and increased the disease and how a good and supporting treatment helped him to recover. Hahnemann used similar techniques as proposed by Perceval and some are even in line with the concepts of modern systemic psychotherapy (chap. 5.2).

However, today in the time of a probabilistic logic, individuality is a nuisance in research and in treatment. This had been already my first experience with a psychotic case as a student at the university, a typical lesson of the 'hidden curriculum' (chap.3.10). In the hospital we were demonstrated a patient hearing voices. We were excited, because until then we had only heard about such cases. We wanted to learn more about these voices, what they said, what this meant in the context of the patient, and so on. But all discussions were interrupted. It was sufficient for the diagnosis and the therapy that he heard voices. Everything else was mysticism. This is how poor observers are educated.

Bernard, also a representative of romantic medicine, came to the same conclusion for physiology. „An experimenter, who clings to his preconceived idea and notes the results of his experiment only from this point of view, fails inevitably into error, because he fails to note what he has not foreseen and so makes a partial observation“ (Bernard: 23). And: “Men who have excessive faith in their theories or ideas are not only ill prepared for making discoveries; they also make poor observations” (Bernard: 38)

Theory shapes the observation. According to the current paradigm, psychiatric diseases are seen as biological disorders. This 'factual' biological approach (Podvoll 1990: 9-10) reduces a phenomenon to a cause and there is no interest in the phenomenon itself (Podvoll 1990: 24). By that it is necessarily poorer in its

description. The general rule says that the more theoretical a description is the less phenomenological it is (Hanson 1972: 60 - 62).

But physicians do not mainly observe or describe. They have to act and in acting they change the course of events. The physician is in a totally different position than a physicist who might smash a nucleus again and again, or as a chemist who might repeat his reactions as often as he wishes. The physician will never encounter the same situation again. By that medicine is the most nontrivial of all sciences.

The action of the physician, however, depends on his theories and observations. A physician who treats biological causes and is not interested in the phenomena or in individuality will behave totally differently than physicians with a 'romantic' attitude. The physician even might induce a recursive pattern in the sense of a self-fulfilling prophecies (chap 4.2) and maintain his opinion even if it is wrong.

Known is the experiment by Rosenhan and co-workers. They asked voluntarily to be admitted to the psychiatric department. They pretended to hear voices and asked for help. Once interned they behaved totally normal, or as normal as they could. The duration of their 'treatment' ranged between 7 and 52 days. No one was unmasked as a fake patient by the staff (although other patients realized). Every behaviour of them was seen as confirming the diagnosis (Rosenhan 1973).

More severe was the case of a German girl who was diagnosed to be hebephrenic by a psychologist at the age of 14. Interned in psychiatry she showed resistance and was put under different drugs. She entered a cycle of resistance and ever more drugs in different institutions. Some time she was so drugged that she was hardly able to move and swallow. After more than 30 years (!) the European Court of Justice released her as it found that the first diagnose was not properly made and the further diagnoses were just a continuation of the first diagnosis. Actually the girl/women never had been ill, but showed normal reactions to drugs and a normal resistance to unfair imprisonment (Ehlers 2005). This kind of attitude which induces to some kind the behaviour it diagnoses has been called an asylum mentality in psychiatry (Foucault 1965).

That is, a certain theory produces at the same time a related action and an atmosphere, facilitating, often supporting and sometimes provoking the expected result. This is not limited to psychiatric diseases. The stress of a cardiological testing (dependent on the attitude of the cardiologist) might aggravated the condition and thus lead to a more

severe diagnosis which, in turn might worsen the whole condition of the patient (Cousins 1990: 55).

As a general conclusion it can be said that an individualizing physician will perceive, behave and treat differently than a generalizing physician. This has a lot of implications.

From a 'modern' point of view psychiatry before the introduction of modern psychodrugs was totally helpless. About the psychiatry of the 19<sup>th</sup> century it has been said: "As he walked the wards of the Salpêtrière Hospital in 19th century Paris, Charcot allegedly gave only two prognoses, solemnly pronouncing at the end of each bed 'Il va mourir,' or 'Il va mourir aujourd'hui.'... and accurate prognosis was often the only useful thing medicine could offer" (Godlee 2005). This statement might be totally wrong. We have no idea of the therapeutic means of former centuries, in how far dignity and other human forms of communication influence diseases. In today's medicine these 'frame' factors are, at best, regarded as a placebo effect (chap. 5.4.b). But the accounts of Hahnemann, Perceval and in modern times Cousins (1990) demonstrate that there is much more in the healing process than the 'specific' treatment.

But as long as only drug therapy is considered, may be, Charcot was helpless. For physicians maintaining a biological model of mental diseases other beneficial strategies are not observable.

This reveals an important trait of complexity: Nearly every statement is true when a supporting theoretical frame is used (chap. 3.6). The influence of theory onto perception has been rarely investigated in general medicine. To exemplify the issue I would like to present another case out of the history of medicine:

When Hahnemann started his medical career bleeding and therapies as enema, artificially administering abscesses or burns to 'draw off' the disease, were the current paradigm. As an excellent observer he noticed that this practice did more harm than good. He did not continue his medical practice and started to write critical articles on the harming therapies of his time. His rift with the medical community came when he accused the private physician of emperor Leopold II of killing his patient by too many bleedings.<sup>6</sup> In 1792 he wrote:

The bulletins (of Leopold's physician) state : "On the morning of February 28th, his doctor, Lagusius, found a severe fever and a distended abdomen"— he tried

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<sup>6</sup> The same fate caught up with George Washington who also died due to repeated bleeding in 1799.

to fight the condition by venesection, and as this failed to give relief, he repeated the process three times more, without any better result. We ask, from a scientific point of view, according to what principles has anyone the right to order a second venesection when the first has failed to bring relief? As for a third, Heaven help us!; but to draw blood a fourth time when the three previous attempts failed to alleviate! To abstract the fluid of life four times in twenty-four hours from a man, who has lost flesh from mental overwork combined with a long continued diarrhoea, without procuring any relief for him! Science pales before this!  
(Haebl 1 1922: 35)

Bleeding has negative effects. This was Hahnemann's observation that challenged the paradigm of the time. So far, this is nothing special, as there have always been physicians who understood quite early that certain practices are not for the benefit of their patients. In the frame of a study of the scientific method this episode is interesting when it is compared with a statement of Magendi. Magendi was not only one of the most famous doctors of his time. He is today considered as the founder of modern physiology and pharmacology. About 40 years after Hahnemann's fiery accusation, Magendi made fun of his colleagues who bled in pneumonia on the side of the inflammation. Since Harvey (i.e., since 200 years) they should have known that both sides are connected making bleeding possible at both sides (Lichtenthaeler 1975: 447).

This example demonstrates that scientific knowledge does not enable to perceive harmful developments and therapies, even if the person is a major medical authority. We have here a typical tension between the theoretical and the pragmatical medicine. Venesection was finally abandoned in a quite modern way. In 1862 (that is 70 years after Hahnemann's publication) Bécclard proved in comparative studies that the beneficial effect of bleeding in pneumonia is an illusion (Bernard 1865: 195).

We saw in this case that Hahnemann by precise observation was able to perceive that the old paradigm was wrong. This is a typical phenomenon. Limitations and errors of an existing paradigm become conspicuous through individual observation, not through planned research. Even new diseases and rare side effects are mostly discovered by observation. Research inside a certain paradigm cannot prove its own faults (chap. 3.3). In contrary, when doubts on the correctness of a paradigm arises by observation, there is a lack of methodology to prove the deficiency of the paradigm (Kuhn 1970: 156-159).

The physician challenging most the current medical paradigm is, up to my knowledge, Oliver Sacks, an American neurologist, who became famous for his case reports. The first account of Sacks was his own case. After the immobilization due to a fracture of

his leg, he developed a kind of a pseudoparesis without neural lesion. It is impossible to define what he exactly had, as there is no neurophysiological tool to do so. Sacks described it as a somatic scotome, as a disturbance of the plan of the body. The immobilized leg was eliminated from the inner representation. It was an unbelievable situation for him and for all of the consulted doctors. Sacks' later investigations showed, however, that this phenomenon was quite common. It was known by patients as they suffer from it. But it was overseen by doctors as they had (and have) no theory to describe it (Sacks 1984). Though, understanding the principles of recursive processes Sacks' experience is no longer enigmatic (chap. 4.2).

In a later book *The man who mistook his wife for a hat* (Sacks 1998), Sacks provides a collection of cases that demonstrate that our current understanding of the function of the brain is deficient, or better: wrong. He describes how certain abilities arise in patients with brain disease or brain injury, abilities that are known only from patients with outstanding talents, something he called *excesses*. Such cases are rarely and superficially reported in neurological literature. For example, an artist became more talented after suffering from frontotemporal dementia and losing his ability to talk (Mell et al 2003).

Sacks describes such confusing cases in detail. He demonstrates the complex pattern of such diseases showing that these patients can only be approached when all linear assumptions are left behind.

“‘Deficit’...is neurology’s favorite word – its only word, indeed, for any disturbance of function. Either the function (like a capacitor or fuse) is normal – or it is defective or faulty: what other possibility is there for a mechanistic neurology, which is essentially a system of capacities and connections? What then of the opposite – an excess or superabundance of function? Neurology has no word for this – because it has no concept. A function, or a functional system, works – or it does not: these are the only possibilities it allows. Thus a disease which is ‘ebullient’ or ‘productive’ in character challenges the basic mechanistic concepts of neurology, and this is doubtless one reason why such disorders – common, important, and intriguing as they are – have never received the attention they deserve” (Sacks 1998: 87).

An example of such ‘excesses’ are hypermnnesia or hypergnosia as already described by Hahnemann with Klockenbrink’s exact feeling of time. In orthodox medicine such phenomena are normally just ignored.

The most incredible case for such an observation that challenges medical thinking is, again, by Hahnemann and it would be unbelievable, if he were not such an excellent observer in all other cases. Hahnemann maintains that that during his more than 50 years of practice he never saw Syphilis stadium II or III if the initial lesion, the

chancre, remains untouched. The chancre, if not treated, might persist even for years (Hahnemann, 1835: 15).

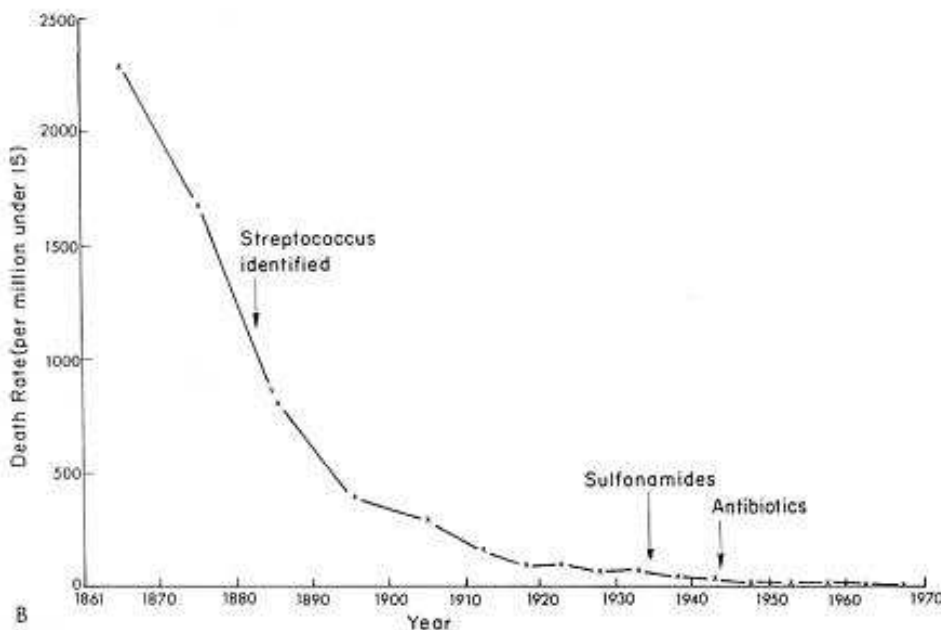
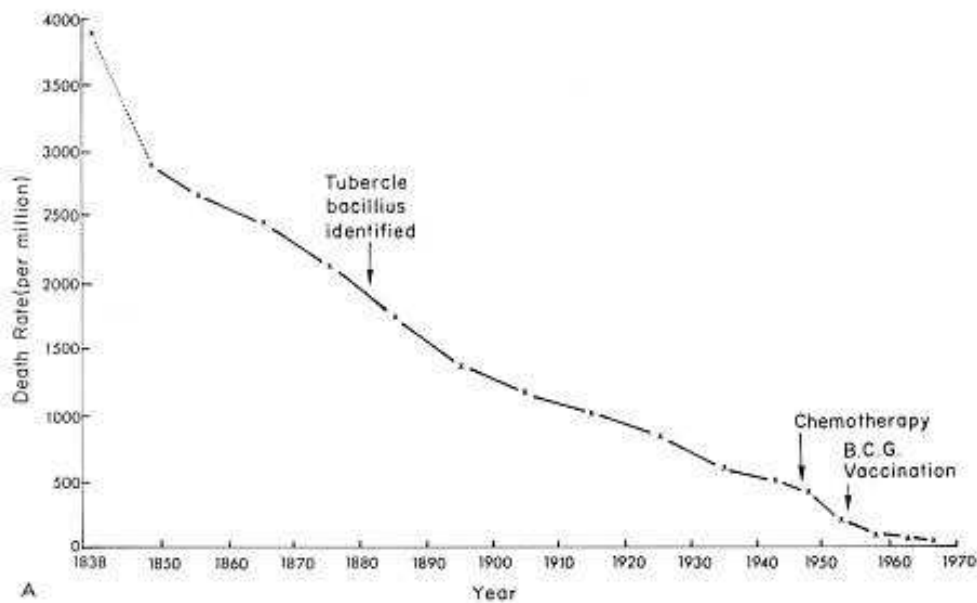
Could it really be possible that all medical textbooks are wrong, because every physician or the patient himself will treat the initial lesion? Yes, it could be possible. We have nearly no idea how processes develop without intervention. Everything is treated with drugs, creams, surgery or whatsoever, often unnecessarily (Doust/Del Mar 2004). Rarely a disease is left to its real natural course. It is therefore possible, indeed, that our understanding of the course of diseases has major gaps or is wrong. Another example will be given later where a lack of theory and the already mentioned tendency to treat everything prevents to understand essential inner rhythms (chap. 5.3).

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One of the main proponents of doing nothing was Bleuler. He maintained that it is much easier to harm than to help (Bleuler 1962: 11). He regarded many therapies as superfluous (Bleuler 1962: 10) only putting the patients at risk (Bleuler 1962: 15). He called his therapy of doing nothing in Latin *udeno-therapy*. He was very strict in what a patient and the physician are able to endure. He maintained that it is quite possible for a practitioner to practice with 40°C fever (Bleuler 1962: 11). His point was that too much treatment makes people oversensitive, such that they become more inclined to get ill.

Bleuler's statements challenge a lot of today's opinions. They involve two main issues. First, Bleuler was not afraid to make *value decisions*, a neglected subject in current medicine (chap. 5.4.b, 6.1). Second, Bleuler's arguments are based on a second order thinking involving *robustness* (chap 6.4), also no issue in the current medical thinking.

The effect of *udeno-therapy* or not treating with drugs is clearly underestimated because the effect of modern drug therapy is overestimated. For example, the increase of life expectancy today is mainly due to reduced child mortality out of infectious disease (Finch/Crimmins 2004) and the decline of mortality due to these diseases was gradual since mid of the 19<sup>th</sup> century. The introduction of antibiotics and vaccinations has not changed anything. The curves of tuberculosis and scarlet fever (Hiatt 1975: 42) are just examples for a lot of other diseases.



There might be a lot of reasoning to explain this decline. But one thing is sure: it was not modern medicine. This epidemiological truth contradicts all observations about the effectiveness of modern medicine.

As a consequence, all reasoning based on the assumption of the effectiveness of our therapies are wrong. That is, even on the level of effectiveness medical cognition is by far not as objective as it is normally assumed.

For example, an investigation of traumatized soldiers of Waterloo and Trafalgar revealed that "despite the non-existence of antisepsis, antibiotics, blood transfusions, life-support machines and other paraphernalia of modern intensive

care, most of these soldiers recovered, often from life-threatening injuries. Yet with all our technical advances in medicine, mortality rates from conditions such as serious infection have not improved dramatically over the past fifty years". The main problem today in intensive care units is sepsis not seen so often in ancient times (Singer/Glynn 2005). This result, as unbelievable as it is, makes sense when it comes to questions of robustness and responsiveness (chap. 6.4).

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In order to understand medical cognition it is also important to realize that Bleuler was wrong in an important point: There is no *udeno-therapy*. It is impossible for a physician *not* to treat. Bleuler treated through his personality. The advice to do nothing and leave something to its natural course is a treatment in a world, where everything is treated. It is an information (chap. 4.1), an attitude (chap. 6.14). Not treating can be even a complex intervention. This shall be exemplified with the following case.

A mother came to me with her 8-year old daughter for homeopathic therapy. The child had been diagnosed with ADHD and had been treated for some time with Ritalin without effect. I found nothing special with the girl. A little cheeky, may be. So I said to the mother: "Your child is not ill". The mother became furious. How would I dare to say this, as she had already seen the psychiatrist, had made three years therapy with a child psychologist, even went to a sanatorium with the girl which turned out to be a catastrophe. She described how the girl behaved badly, vomited into her meal with everybody present, etc.

The reaction of the mother, according to the theory of systemic psychotherapy, demonstrated that the family is in a certain balance with the child being ill (chap. 5.2). The attempt to take away even the diagnose was a threat for her. This explains – according to the theory – her fiercely reaction. In this situation I had two possibilities. One was to submit to the mother's will and to treat the child, or to find a solution that maintained my authority. I decided to write the following receipt:

1. The girl is not ill, only a little loud
2. She has the right to express her loudness
3. If she violates the rights of others she has to be punished
4. The parents are not allowed to fight about the behaviour of the girl.

This was only an explicit form of stating what I had said anyway in our conversation. But it was combined with a signification: the receipt. That is, every therapy has a semiotic aspect (chap 3.9), even the *udeno-therapy*.



In this case the intervention worked: The girl was happy, the father stayed at home more often (probably because the mother did not complain anymore about the child), the mother slowly relaxed, the results at school became better and so on. This was a very specific form of doing nothing and contained some well-defined strategies of systemic psychotherapy.

Most practitioners use similar or other tactics when doing nothing. We all have such stories.

Simon who worked on this subject theoretically describes such interactions as follows: “Whenever a person is labelled as a patient, a specific context is defined, i.e. a social situation with given rules that differ from everyday pattern of behaviour and relations. The role of the *ill* one and the *healthy* one ensure that the rules of everyday (e.g. inner familiar) interactions are no longer negotiated freely, but follow a certain cultural determined expectation” (Simon, 1995: 111, my translation).

Thus, there are possibilities to influence the structure of interaction in doing nothing, or in doing something. The idea of a neutral relation between physician and patient is absurd. Or better: A neutral stance is medically inferior as an affective one (Roberto 1991: 468). Just as it is impossible not to communicate (chap. 3.7), it is impossible for a physician not to treat. Udeno-therapy is a therapy where many things happen we never are aware of, far from any theory. This does, of course, not only happen when no treatment is intended. It happens always. This implies that there is a big difference between what we do, what we think we do and what others think we do.

The psychoanalyst Michael Balint investigated this interplay between physician, patient and medical perception (Balint 1964) and until today physicians meet in *Balint groups* to analyse their perception of the therapeutic relationship and their theory of their own and the patient’s behaviour. As this, as seen above, is only of interest when things do not develop as expected, Balint groups are a good tool to understand ‘difficult’ patients and cases.

### **2.3 The Psychosomatic Confusion**

Probably only a few subjects have been as intensively discussed the last hundred years as the relation between mind and body. We just faced a new wave of books and articles triggered by neuroscience. Special journals investigate the related subjects at

all depths and we even entered the ‘decade of mind’ (Spitzer 2008). However, the situation has not become any clearer.

One reason is that there is a lot of confusion on the definitory level. An undisciplined thinking prevails. Mind and psyche are often not defined or defined through each other. They are vague concepts no physicist would dare to work with (Bleuler 1962: 58).

Mostly it is taken for granted that everybody knows what mind is. Statements are based on *silent assumptions*. Indeed, there is no problem in everyday use. If anybody says: “It came to my mind”, we understand what this person means. But we should not look in detail what came where to. This lack of precision is much more prominent in the mind related sciences than in other branches of medicine.

The consequences of silent assumptions on a definitory level shall be exemplified with Jurij Gagarin. When Gagarin first flew into space he claimed that there is no God as he had not seen Him. In this example Gagarin’s definition of God was that of a superhuman being dwelling a little above ionosphere. Comparingly, all statements on mind depend on an inherent definitions. Such silent assumptions have major consequences for the understanding of ‘psychosomatics’, of diseases and of therapy. They represent the decision of an undecidable question (chap. 3.4).

The aim of this chapter is to demonstrate the impact of such silent assumptions. It is not of interest here what mind really *is*. The question is more, how descriptions transform observations and how they lead to certain conclusions.

### **a) the Cartesian split**

Mostly the term mind is associated with a body. In this common use, body and mind create each other complementarily. Mind is what is not body and body is what is not mind. They exclude each other (von Uexküll: XXVI), but both remain undefined. It is like Rubin’s vase with only grounds and no figure.

This leads to the unsatisfactory situation that a distinction is assumed where actually is none. This becomes clear when someone aims to attribute a certain process to the body or to the mind. Heartbeat is body. But is the quick heartbeat in excitement body or mind? One might argue that it is body as it concerns the heart. But then every physiological process would be body. One might



argue that it is mind as excitement is an emotion. Then the sino-atrial node which is controlled by the autonomous nervous system and by emotions would be mainly mind and the slower pacemaker of the atro-ventricular node would be more body. That is, the body – mind split could be located exactly between these two pacemakers. This is of little use, just as all the other attempts to locate this split. The distinction is neither precise nor helpful. But more important: it does not represent any kind of reality. Things are even more confusing when one goes a step further and asks about the psycho-somatic model: How do the two parts (body and mind) influence each other? In this context it is often referred to physiological components like neurotransmitters. But this is no solution of the logical problem as it pushes the undefined distinction only further. What is a mind able to release neurotransmitters? If such a mind is assumed, it has to have power over matter. But without a construction like a ‘mind’ one has to assume that quantity can determine pattern. It is a kind of logical deadlock and Bateson defined both possibilities – a mind which has power over matter and the assumption that quantity is able to create pattern – as superstition (Bateson, 1988: 57-60).

Uexküll proposed to see body and mind as different levels of the system human (von Uexküll 1986: 10). This would explain the lack of a distinction. But such a definition does not solve the problem what mind really is and how it relates to the body.

Günther proposed that the body – mind split is a consequence of a binary logic (Günther 1976: 208-213, Günther 1979: 203-240). If true, - and there is a lot of evidence supporting this view – it would imply that the Cartesian split is a convenient method to maintain a linear, two valued methodology which is unsuitable for biological processes. The Cartesian split is probably a main hindrance in the attempt to develop more appropriate concepts of the living.

A hint in this direction is that a lot of ‘scientific` concepts of mind come from neuroscientists, psychoanalysts or philosophers and have one thing in common: they are developed by observing immobilized persons (under stable conditions).

Psychoanalysis or brain scanning are classical examples where the ‘body’ is to be held as stable as possible. If one takes into account that “even the change in posture, while preserving the same identical sensorial stimulation, alters the neuronal response in primary visual cortex” (Varela et al 1993: 93) it might be assumed that a ‘mind’ found in such a context will differ fundamentally from a ‘mind’ in action (Niedenthal 2007). In fact therapists working with people in motion never thought of

mind being something different from the body. From Reich's *Charakteranalyse* (1933), Perls' *Ego, Hunger and Aggression* (1946), Lowen's *Institute for Bioenergetics* (1956) to Petzold's current *Integrative Therapy* (Petzold 1998) there is a clear line that Ida Rolf summarizes: "There ain't no psychology, just biology" (Johnson 1998: 6).

#### **b) minor concepts**

Mind as explanatory principle (chap. 3.3): An explanatory principle is "a sort of conventional agreement between scientists to stop trying to explain things at a certain point" (Bateson 1972: 39). In medicine the word 'psychological' is often used in this way. That is, something is classified as psychological and erased from the usual scientific frame. In this use mind seemingly explains a fact, but it does not allow to analyse the given situation any further.

Confusing map and territory: Sometimes mind is thought of an organ such as the liver or the gall-bladder. The expression "It came to my mind" is taken for real. It reminds the (not so rare) women who, operated at the bladder ('bladder plastic'), think they now have a plastic bladder.

Concepts of life: Quite often mind is seen as the basic expression of life. All sorts of characteristics attributed to living processes have been defined as 'mind', such as organisation, structure etc. (Glassop 2003) or even all evolutionary processes (Bateson, 1988: 16-20). This approach is coherent, reliable in its inner logic and connects observations with processes. But it is not used in the medical context. Therefore its implications will not be discussed.

#### **c) mind as a kind of 'soul'**

Mind is often described as something coming from outside, not really belonging to the body, at best embodied. The Christian soul and other spiritual formations belong to this class. Then psychosomatics (the influence of a mind onto the soma) could be transformed into theosomatics (the influence of gods and spirits onto the health of a person). This definition of mind is rarely used in the scientific context, as it does not refer to observable mechanisms. Unexpected developments are normally classified as placebo effect. Nevertheless, many physicians take such a mind for granted.

#### **d) mind as brain function**

The neurophysiological approach sees mind mainly as a brain function (Zimmer 2003). “Minds are simply what brains do.” (Mobbs et al 2007). The activity of certain areas of the brain correspond to certain emotions and perceptions. Personality in this context is just a creation of the brain, allowing even different personalities (multiple personalities) to coexist virtually with their own neuronal pattern in one brain (Carter 2003).

Disorders as depression or phobia correspond to specific neurophysiological processes. Afterwards these patterns can be described as pathologic. In Edinburgh a research centre tries to establish a quick diagnosis by brain scan only, not depending any longer on human expertise which takes more time and is ‘not reliable’ (wissenschaft.de 27.4.2002). Deviate patterns found by brain research then can be corrected by changing transmitter metabolism or by electrical stimulation, even before a clinical diagnosis can be established (Schmidt 2007). It is regarded as a good tool for prosecution, as well. Some neuroscientists maintain that they are already able to detect liars (Yang et al 2005), terrorists (Wild 2005a) and future criminals (Mobbs et al 2007). This leads to the ethically problematic situation whether future criminals should be arrested in an early stage, that is, before they commit their crime just on the basis of a brain scan.

But all this stands epistemologically on no firm ground. What we see here is the *metaphysical shift from description to prescription* (chap. 4.6). Some observed patterns are called normal, others pathological. Next the pathological pattern is supposed to be causal for the defined behaviour.

For example, children with bigger amygdalas have more tantrums (Whittle et al 2008). Or hyperkinetic children have a different brain metabolism, e.g., diminished circulation in the frontal lobe and basal ganglia as well as a significant smaller corpus callosum (Semrud-Clikeman et al 1994). But these children probably might also have a different muscle tone and or a different level of catecholamines. There is no reason to see the changes in brain as the cause and the muscle tone as the effect. However, the strategy to influence brain metabolism in order to achieve 'normal values' is based on this kind of hypothesis, on the assumption that ‘mental diseases’ are diseases of the brain.

This biological model, introduced 1845, has as foundation an unobserved psychological disease that is explained physiologically or structurally and corrected

by fighting its self-defined cause (Simon, 1995: 34-40). This procedure is not only highly doubtful from an epistemological point of view. It also does not stand up to observations. The Serotonin hypothesis for depression, for example, assumes that a lack of Serotonin in the brain or in certain areas causes the disease. But it takes weeks after the 'correction' of the Serotonin levels in the brain until the symptoms improve. Sometimes the symptoms persist despite the 'correct' level of Serotonin. Sometimes the medication has severe side effects or might lead to addiction. Moreover, it is possible to overcome the disease without the administration of neurotransmitters (Stutz 2007). That is, the relation of cause and substitution is inappropriate to describe the observed events sufficiently. This model has even been characterized to be rather an 'advertising' than a scientific description (Lacass/Leo 2005). In reality, Serotonin levels are just one parameter in an emergent process (chap. 4.10) and a therapy influencing brain Serotonin levels are but a stimulus (chap. 6.10) leading to an adaptation of the brain metabolism.

If neurophysiological findings would no longer be regarded as causes but as correspondences or correlations the whole understanding of regulation and disease would change (Weiner 2003). Visual perception might serve as an example: Many receptive areas in the visual cortex are known to respond to straight and diagonal lines, to corners and angles. We are told that a person sees these structures, 'because' these areas react. However, no receptive area for curve lines have been found (Zeki 1999: 116). That is strange, as the environment of 'natural' man consisted mostly of curves. As it is too obvious, nobody claims that humans do not see curves. But this would be the only logical consequence if a causality is postulated. And it is done in nearly all other cases if findings do not contradict too much our experience. Notorious is the statement of visual physiology that 'in reality' we see everything upside down. Not only the 'causes' but also the proposed mechanisms do not correspond to observations. In visual perception the order of events is not at all as depicted in most textbooks of neurophysiology. "The behaviour of the whole system resembles a cocktail party conversation much more than a chain of command" (Varela et al 1993: 96). There exists a "patchwork architecture of cognition" (Varela et al 1993: 105) with different receptive areas but without a centre bringing the signals together, no mind, no *homunculus* (Varela et al 1993: 49, Comfort 1984: 3) doing the job. Cognition 'emerges' from physical processes in neuronal networks where no self can be identified (Metzinger 2003). But to use expressions like emergent or other figures

of speech only obscures the fundamental disability to describe brain function with the current epistemology. Therefore doubtful conclusions are drawn such as: “The self thus turns out to be identifiable not with a non-physical soul, but rather with a set of representational capacities of the physical brain” (Churchland 2002). The problem is that intuitively we think of the brain, the mind or the self as a linear, centrally organized system although it follows the principles of a distributed control (chap. 6.5) (Singer 2009).

Taking the findings of neurophysiology seriously, something that few scientists dare, leads to the assumption that there is no self. Maintaining the idea of an existing self leaves us, therefore, in a state of schizophrenia (Minsk cited in Varela et al 1993: 107) as scientific findings contradict our every day and philosophical beliefs.

That is, the current epistemic concepts are insufficient to describe what is observed. A concept which came lately under scrutiny in systems science is the discrimination between central and distributed control (chap. 6.5). Although the idea of a distributed control is rather successful in engineering and artificial intelligence, it did not enter biology or even psychology to the same extend, despite the fact that biological functions are mainly organised according to the principles of distributed control. Maybe the idea of a self, which is nothing else than a central control in its purest form, is the main obstruction to the understanding of mental processes.

#### **e) mind as inner experience**

Many authors define mind or psyche as inner experience. Mind is how a person sees, feels, judges. This leads to a certain uniqueness. “Psyche is a sphere of phenomena that is observable only by one person directly (in self observation)” (Simon 1995: 102-103, my translation). In this sense von Uexküll defines the psychosomatic model as “which role the individually experienced reality of a person plays for health and disease” (von Uexküll 1986: XXV, my translation). A lot of psychological approaches use this model. Maps of psychosomatic interrelationship are drawn on the basis of tests, interrogations and discussion. Again, there is the enormous danger of the metaphysical shift - from description to prescription - when descriptive relations are seen as causal. As long as this does not happen, these maps have some value in the classification of disorders, in the evaluation of the course of therapies and the prediction of further developments.

The theoretical problem arises, if an inner mind is not seen symbolically, as a somehow vague description but as something real. Then, again, the question of the distinction arises: From when on do children have inner experience and therefore a psyche? Handicapped? Victims of an accident? Brain dead? Animals? Where does it come from? Where does it go to? What happens if someone in the opinion of others seems to be in bad mood but denies it? Is he in bad mood or not? And what if he corrects himself after several hours and admits that he *had been* in a bad mood? Or if he never realizes?

In order to overcome this problem the term of consciousness is used. But this is of no real help. For example, a patient in a vegetative state showed signs of a normal pattern of brain reaction to spoken sentences (Owen et al 2006). She was considered as conscious by many scientists, but not by others (Nacchache 2006).

Consciousness in normal use describes what a person says to experience at a given time. It has to do with a sensation of unity. Some relate consciousness to the so called neurophysiological *parsing*, the ability of the brain to work on only one task a time. The related time frame is a few hundred milliseconds, the so called psychological refractory period (Varela et al 1993: 75-79). Parsing seems to be a method to process all incoming data (Sigman/Dehaene 2006). Consciousness also has been related to re-entrant interactions between posterior thalamocortical areas involving areas related to memory, value and planning for action (Tononi/Edelman 1998). Here consciousness would be the eigen-behaviour (chap. 4.2) of a recursive brain function.

All these approaches see consciousness as a kind of figure on a ground of 'unconsciousness'. Thus, unconsciousness remains the undefined. This is why unconsciousness has no coherent logical basis (Miller 1942). However, such a consciousness as the figure on an unconscious ground has nothing to do with a causal mind often encountered in psychosomatic literature.

#### **f) mind as behaviour**

To avoid all these difficulties the totality of the expressions of a person might be called psyche (Papadopoulos 1996: 639). Psyche is then a *black box* that produces behaviour (Watzlawick et al: 43-44, Varela et al: 45). The question of 'consciousness' or 'unconsciousness' just does not arise.

Observation as starting point for mind also has the advantage that criteria can be defined in order to establish a diagnosis. However, this approach is in a way



totalitarian. It leaves the power of definitions to others. The 'typical' psychoanalyst who is free to define the behaviour of others as 'resistance' or as 'unconscious' just as he likes is the humouristic version. More serious is the dilemma of people considered insane and consequently isolated or treated with drugs as in the already cited case of a misdiagnosed girl held in institutions for 30 years (chap. 2.2). In dictatorship the norm of behaviour is so strict that even a different opinion might be seen as a disease as in the former Soviet Union (Bukowskij 1971) or in China today (Munro 2002).

The question who decides on mental disorders is controversially disputed. "Officially, diagnostic decisions are made through scientific consensus by the World Health Organization and the American Psychiatric Association. Small committees of experts decide whether, for example, schizophrenia is one disease or several, and the process of decision making should be transparent and based on good scientific evidence. But sometimes the evidence is poor and influenced heavily by the pharmaceutical industry... which lead to an increase of new diagnosis in the last four decades" (Shorter/Tyrer 2003). The scientific community might or might not decide on the reliability of such new diseases. The concerned individual not.

#### **g) conglomerates**

Mostly the use of the term mind is a kind of mixture of all these definitions. Sometimes the use is quite clear as in psychoanalysis where the psyche is the inner sight, the meaning however is settled by observation (the therapist). Sometimes definitions are a kind of patchwork as "By the term 'mind' I mean ideas and purposes. By the term 'body' I mean stuff and process" (McCulloch: 72). But mostly scientists are not aware that they use a conglomerate of incongruent definitions. This becomes a problem only when such a 'mind' is more than a figure of speech used to illustrate certain processes.

To a certain extent, the confusion cannot be avoided as the distinction between an inner and an outer sight is already artificial and mechanistic. Varela called this an endless oscillation between subjectivism and objectivism in the search for ground in a groundless state (Varela et al 1993: 141).

Somehow, everything is an inner experience, as everything is based on sensual perception. This has been summarized by radical constructivism and has been confirmed in practice by Piaget and Gestalt psychotherapy. Even observed behaviour (what is sometimes called objectivity) is nothing else than the abstract of several inner

experiences. In the extreme cases it is only the inner experience of one expert. On the other side, everything can be seen as coming from the outside. Nothing ‘emerges’ by accident. All observations, values and beliefs are the product of development and socialisation. Every idea is formed through ‘outer’ language and learned behaviour (Sacks 1989). Extreme forms of socialisation like the twins (Sacks 1998), the wolf children (Maclean 1978) or the children of the deaf school in Nicaragua who developed their own language (chap. 4.2) show how essential communication is for the construction of reality.

The interconnectedness of the inner and outer world is nothing else than the simple but basic discovery that man is a social being. As he only exists in a social context, it is the context that determines behaviour and experience (Varela et al 1993: 197).

‘Mind’ is not found inside the autopoietic unit (chap 4.8). It is found in the relation to others and to the environment (Maturana, personal communication). It is the interaction of physiology, history, experience and emotions (Melmed 2001a). In such a view experience and behaviour are neither limited to the brain nor to the brain and the body together. A separation from others or from the community is highly superficial. The term ‘family somatics’ (Kröger/Altmeyer 2000) is as applicable and correct as ‘psychosomatics’.

Such a mind is as diffuse as the definitions of the organs in acupuncture which include all related functions and are not restricted to anatomy and physiology (chap. 5.6). This functional view of mind has a certain right to exist. But it should be clear that it is a description of a complex process and no source of causality.

#### **h) environment and its limits**

Kuhn, 40 years ago, doubted that psychology has reached the state of a ‘science’ (Kuhn 1970: 160). Mind and psyche are a bit like the sky. It is there, if we look up, but it is not there, when one goes closer. There is no place where sky *is*. Sky is seen only because earth does not end at its surface. It has an environment. Sky emerges, just as von Uexküll's mind emerges in an environment. But it does not ‘exist’. It is an by-product of a certain angle of observation, not existent in a different angle of observation. This would imply that the ‘existence’ and definition of mind depends on the point of view (what has been demonstrated above). But the term environment as used here is deceiving. It pretends that there are separate things with a different logic being in contact. However, von Foerster claims that even the environment is an

invention (von Foerster/Bröcker 2002: 48-49), or, less strictly, that a system and its environment are energetically and structurally coupled in such a way that a separate self-organisation is a myth (von Foerster 1960).

The idea of a somehow distinct environment is also inherent in the concept of the 'system mind' in opposite the system of the body and the social system (Luhmann 1997; Simon 1999b). But this concept has the normal shortcoming of all concepts of body and mind: it provides no mechanism of interaction and leads to a certain confusion.

Atopic disease is known to affect different parts of the body. It mainly starts in childhood with an eczema often localised at the bends of knees and elbows. This eczema vanishes and later (sometimes years later) asthmatic disease arises. Also the opposite development is known. The asthma goes away and the eczema reappears.

These are changes describable with physiological pathways.

Patients with asthma have a doubled risk of becoming depressive (University of Washington 2007). Sometimes (as I could observe several times) asthma goes away when depression starts and Simon describes a patient where asthma vanished and he became psychotic (Simon 1999b: 187).

If one assumes a distinct 'system mind' there would be a change *in the system* of the body, when eczema develops into asthma or vice versa. There would be, however, a change *of the system* (from body to mind) in the interplay of asthma and psychosis or depression. In the first case the same logic could be used which becomes invalid in the second case as soon as a mind is introduced. This reflection is not messing around, as it concerns the important field of the so-called 'comorbidity'.

### **i) comorbidity and the psychosomatic complex**

Comorbidity is a state where both, the 'system body' and the 'system mind', are ill. For the comorbid states of depression, ICD 10 distinguishes a primary and secondary form. Primary depression is a depression due to a 'psychological cause', secondary depression is one due to a 'somatic cause'.

The resulting possibilities read as follows (Härtner 2000):

1. a somatic disturbance causes biologically a depression (Hypothyroidism);
2. a somatic disturbance precedes a depression in genetically vulnerable persons (e.g., Cushing syndrome is known to precede a major depression);
3. a depression develops on the basis of a somatic disease (e.g. in cancer);

4. a depressive disturbance precedes a somatic disturbance and may be eventually causal for it (somatisation);
5. the somatic disturbance and the depression are not causally interconnected but coincidental.

To assign a 'comorbid' person to one of these classes is an arbitrary undertaking. Causality arises according to the theory of the observer. Strict neurobiological therapists see everything as biological, as somatic. When ADHD hyperactivity (understood as a disease of the soma) is combined with anxiety (understood as a disease of the psyche) the biological approach solves the 'comorbid' paradox, for example, by seeing everything caused by the function of the mesolimbic dopamine systems (Levy 2004).

On the other side, strong psychoanalyst and psychotherapist argue that most or all somatic disturbances are a consequence of some inner or social conflicts that influence metabolism. Even the C-reactive protein, an indicator for inflammatory processes and therefore clearly 'body' is elevated through anger and sadness (Suarez 2004) and blood clotting is increased through anxiety (Känel et al 2004).

The whole situation is absolutely frustrating and already Babinski found the distinction of neurological or neurotic disease not applicable to many conditions. He defined, therefore, a third area of different nature, a *syndrome physiopathique* (Sacks 1984: 231). But this increases only the dilemma, as the whole concept of comorbidity contradicts the understanding of humans as autonomous, self-regulating beings.

In complementary and alternative medicine (CAM) there has always been a tendency to see humans as a whole and to define diseases as an imbalance. In such a view the distinction between a psyche and a soma makes no sense. Body, psyche and mind are parts of the same system (Hammer 1990: 86). Humans are emotional embodiments as far as organs and their function allow them to be (Worsley 1982: 60). Emotional and behavioural symptoms are an expression of the 'human' just as gastritis or athlete's foot. It is a matter of habitude to see a tic, for example the twitching of the eye lid, as a symptom of the eye, of the nervous system or of a mind.

Neurophysiological, emotional, behavioural or cellular aspects are then but a different way to map the human condition. It is more a question of practicability which decides on the selection of the map. If this were understood properly most disputes would vanish (Bleuler 1962: 59). The psychosomatic problem arises only if an analytical point of view is chosen and/or if the question "what causes what" is introduced.

## **j) conclusion**

As a general result, the body-mind concept is mostly neither in line with scientific findings nor with a strict epistemic view. It is somehow like an old artist who has missed the right moment to quit the stage. Therefore, I recommend to use more concrete terms such as behaviour, experience or feelings which represent definable states of observation. The terms mind and psyche seem not to be precise and reliable enough.

## **2.4 The Placebo Effect**

“I believe the real lesson physicians can learn from the placebo experience is not that an inactive compound may be therapeutic but rather that the body’s healing responses may be activated by the patient’s anticipation of a cure. The challenge lies in learning what we have to do as healers to most effectively activate these mechanisms” (Melmed 2001b).

Whereas the discussion on psychosomatic confusion suffers from an undisciplined thinking, the usual approach in the assessment of effectiveness of a therapy goes the other way. It follows a very clear and strict pattern. The attempt to establish knowledge with placebo controlled trials is a straightforward method. May be, this is why it is liked so much. A minute analysis, however, shows that this method also suffers from a kind of undisciplined thinking. This lack of discipline has, again, to do with its epistemology. The placebo-phenomenon is discussed in detail, as it demonstrates some kind of unavoidable confusion when health and therapy are described with unsuitable tools. As soon as a systemic concept is used all the paradoxes around the placebo effect vanish.

\*

Placebos are the centre of every medical trial, they are the foundation of ‘evidence based medicine’. There exists even an institute to investigate their effects (UCLA Neuropsychiatric Institute) and “more placebos have been administered to research participants than any single experimental drug. Thus, one would expect sufficient data to have accumulated for the acquisition of substantial knowledge of the parameters of placebo effects “ (Kirsch/Sapirstein 1998). But the opposite is

true. Only those who never looked closely at the issue know what it is. Indeed, there seems to be nothing more enigmatic than the placebo effect (Roth 2003).

In short, the placebo effect is an ‘anomaly of normal medicine’. Anomalies of normal science are, as Kuhn stated, no anomalies but processes that cannot be described properly with the current paradigm. This has been stated by many scientists: “The placebo effect is... all that is beyond scientific explanation in the healing process” (Grob, P, cited in Gauler/Weihrauch 1997: 42, my translation). “Placebos are the ghosts that haunt our house of biomedical objectivity, the creatures that rise up from the dark and expose the paradoxes and fissures in our self-created definitions of the real and active factors of treatment” (Harrington 1997: 1). It also has been called the ‘nuisance variable’ just to spoil the whole subject (Peek/Coleman cited in Spiro 1997: 40).

Therefore, the uncertainty around the placebo effect is not due to a lack of knowledge or data, but due to a lack of a suitable epistemological tool. As long as certain inadequate axioms are maintained, the placebo effect will continue to create difficulties.

Although everybody concerned with placebo effects is well aware of the paradoxes, in every day discourse there is a naïve realism (often with a twinkle of the eye) knowing exactly what placebo means – and by that it resembles a bit the notion of mind. However, „the biggest enemy of understanding the placebo is common sense” (Field 1997: 216).

The main explanation of the placebo effect is that it is a ‘psychological’ or ‘psychosomatic’ process. But, as shown before, this is but a word if it does not refer to a mechanism of action. It is not only poor reasoning, it does not stand up to all research as well. A higher suggestibility, e.g., does not correspond with a higher susceptibility to placebos. Also most other attempts to model the ‘psycho’-hypothesis scientifically failed (Gauler/Weihrauch 1997: 14-16).

In this chapter I will show that

1. the placebo effect is an explanatory principle,
2. the placebo effect is a statistical parameter,
3. the placebo effect is an expression of an arbitrary causalisation,
4. the placebo effect vanishes if a systemic view is taken.

## a) the placebo effects and their paradoxes

A paradox is the discrepancy between reality and the idea how reality should be.

Richard Feynman

My first contact with placebos was during an internship in a rehabilitation clinic. I was called to a patient (5<sup>th</sup> day after an operation of an intervertebral disc) at 2 a.m. She had severe pain, although she had already taken all oral drugs (all RCT proven) left for emergency. She said that only an injection could help her. So I injected an ampoule of physiological salt solution. Already during the injection she relaxed and slept in my presence. The next day she was refreshed and nearly free of pain.

This is an undisputable example of a placebo effect that corresponds to all the parameters under which a placebo effect is to be expected: previous medication, strong pain, expectation and injection (Gauler/Weihrauch 1997: 13-16).

How does this fit into a scientific concept? What is the basis to see here a placebo effect? If I had injected half of an ampoule of diazepam (still often in use then and the most probable alternative), this would not have been spectacular. But as it was salt solution we define the reaction as a placebo effect. Colloquially one could say that salt solution does not give rise to such effects. This is the usual, mostly used logic. However, it is not logical. This example proves that salt solution gives rise to such effects. This is a main, mostly overseen phenomenon in the discussions of placebos. A therapeutical effect is declared as not therapeutical. **The reversal of causal logic is the definitory foundation of the placebo effect.** Only by a therapeutical force something becomes a placebo. An injection of physiological salt solution has an analgetic and sedative effect. My example is prove. The only objection would be to say that the patient would have fallen asleep anyway without my therapy, which is not very probable.

What looks like a piece of juggling is nothing but a change of the frame of observation. A *verum* (the drug containing an effective substance) is expected to have an effect, therefore only the substance is seen. A placebo (or what is defined as such) is expected to have no effect, therefore the frame is observed. It is a (metaphysical) change of strategy of observation.

Normally the problem is solved by modelling. It is assumed that physiological salt solution on grounds of our physiological knowledge is not able produce analgesia. Although logical, it does not solve the main problem. An effect is not the result of a model but of an observation. A model has to explain the facts not the facts the model. This is a widespread mistake. A substance is defined as placebo because the scientist or author just cannot imagine that the substance might have an effect. So Shapiro (the father of placebo research) states - a little bit complacent - that in ancient times “the astonishing total of these ancient remedies is about 4,785 drugs and 16,842 prescriptions. Even more startling is that with only a few possible but unlikely speculative exceptions, all were placebos” (Shapiro/Shapiro 1997: 13). He subsumes under placebos e.g. mandrake, a plant with a high concentration of alkaloid substances which in ancient times was used as anaesthetic drug during operations (Baumann 1999: 108) and is the emblem of the Hellenic Society of Anaesthesiologists.



It is the lack of knowledge paired with a false certainty that old medicine was helpless that leads to such wrong conclusions. Similar mistakes happen if the theory of a remedy is rejected. “Paracelsus...used the placebo effect of his remedies: ...Chelidonium because of the colour of its sap as a remedy for liver and gall bladder” (Gauler/Weihrauch 1997: 172, my translation). However, Chelidonium, that’s sap is a little bit yellow as bile, contains a big amount of biological spasmolytic substances, and is effective in cholecystopathia and cholecystolithiasis (Gessner 1974: 55-56).

Moreover, not so rare the model of physiological and pharmacological pathways is wrong “Until recently, medical students were taught the pathophysiological reasons why  $\beta$ -blockers are contra-indicated in heart failure (they are a good treatment for heart failure); why colloid is more effective than crystalloid for fluid replacement (it is worse) and that because the vascular supply of the scaphoid places it at risk of non-union, any suspected fracture requires a cast (active mobilisation results in better outcomes) ” (Doust/Del Mar 2004).

It is common practice to call substances a placebo that do not work according to the beliefs of the scientist. We know nearly nothing on the medical power of a list of



'ancient placebos' as "theriac, mattioli, mithridate, bile, blood, bee glue, bones, bone marrow, claws, cuttlefish, cock's comb, cast-off snake skin, fox lung, fat, fur feathers, hair, horns, hoofs, isinglass, lozengs of dried viper, oil of brick, ants, and wolves, powder of precious stones, seasilk, sponge, scorpions, swallow's nest, spider webs, raw silk, teeth, viscera, worms, wood lice, human placenta etc" (Shapiro/Shapiro 1997: 14). As long as there are no RCTs it is nothing than a belief and even then there is no proof, if, as with Viagra (chap. 2.5.c) not the right parameter is investigated. The conclusion that ancient "therapy rested on placebo foundations, despite the tendency of historians to glamorize, sentimentalize, and exaggerate the significance of primitive and prescientific medicine" (Shapiro/Shapiro 1997: 15) is no valid statement. There might be highly effective drugs among the mentioned list. There might have also been a precise knowledge how to administer certain drugs.

It is habit to call a remedy a placebo not in line with the current hypothesis of effectiveness. But to take the model of a therapy as the basis of placebo definition leads to a variety of paradoxes. It would mean that having a model makes a remedy an active substance (*verum*) and the lack of a model a placebo. So Jenner's vaccination would at first have been a placebo and after understanding the physiological process a *verum*. The same with aspirin. It was prescribed long before we understood how it relieved pain (Spiro 1997: 40).

The next mistake in the 'model hypothesis' is that there is a model for nearly all medical activity. Immediately the question arises whether or not someone believes the model. Do I believe that venesection frees an organism of unhealthy substances? Do I believe that digitalis strengthens the heart? Do I believe the models that the peoples in the rain forests (often using forces of gods) have for their highly effective plants? But it is even more complicated: One placebo definition says that a placebo is "a pill deemed inactive by a physician but given to relieve the complaint of a patient" (H. Shapiro cited by Spiro 1997: 44). According to this definition a substance is a placebo, when the doctor believes it to be a placebo but the patient believes it to be a *verum*. However, a placebo works better, if the practitioner believes it to be a *verum* (Benson/Epstein 1975). Then a placebo is a substance where the practitioner believes it to be a *verum* but the scientific community believes it to be a placebo. But effectiveness is not a decision of one person or a community but a result of observation.

Physiological salt solution is a placebo and not an analgetic drug not because nobody believes it to be an analgetic drug nor because there is no model, but because normally it is not effective as an analgetic drug.

From the point of observation it only can be said that a placebo has normally no certain effect (because sometimes it has one) and a verum normally has a certain effect (because sometimes it does not have one). Theoretically (and practically it is the same) there is no clear distinction between a placebo and a verum. The expressions describes an arbitrary judgement on a coordinate of effectiveness in a certain frame of observation. A verum becomes a verum if it is more effective than a placebo. *Verum and placebo are but statistical parameters that are mutually conditional*. That is, there is no placebo effect as such. Verum and placebo are probabilities of effectiveness, terms of describing collectives without semantic relevance (chap. 2.1.d). Therefore they cannot be applied to the individual case. This is according to the current theory that a causal connection can never be stated in a singular observation (Kiene 2001: 12ff).

The scientific correct statement would be: “ As physiological salt solution normally (or: statistically) has only a small analgetic effect, it is in this case probably a placebo effect”.

### **b) the semiotic approach**

In the last years there is a gradual shift in the understanding of placebos. Some authors investigate how the expectation of a patient influences the outcome of a therapy. Although this is only one aspect of placebos, it is a change of perspective. The centre of investigation is no longer the effective remedy but the reacting person. Benedetti et al. administrated drugs and stopped administration openly and hidden by an automat. So some patients knew when they were treated and some not. The results show that the knowledge of the administration influences the outcome. In anxiety the knowledge was the only therapeutic factor.

But the effect was also strong in postoperative pain and in Parkinson's disease (Benedetti et al 2003). The authors are cautious to call this a 'placebo effect', as there cannot be such an effect without a placebo. They talk of “meaning and meaning-induced expectations”. This is supported by other authors: “We define the *meaning response* as the physiologic or psychological effects of meaning in the origins or treatment of illness; meaning responses elicited after the use of inert or sham

treatment can be called the "placebo effect" when they are desirable and the "nocebo effect" when they are undesirable" (Moerman/Jonas 2002).

This shift in the understanding of placebos is a step forward, as it comprises a notion of information which is no longer congruent with the notion of signal (chap. 4.1) and it refers to the semiotic aspects (chap. 3.9) of therapy – all issues exceeding current concepts of the placebo effect, but necessary to understand the healing process.

Nevertheless, Benedetti's work does not refer to placebos but only to one subject (expectation). It can be assumed that the reaction (and the expectation) of a young male after an operation will be different when helped by a young beautiful female nurse or by an old male nurse. This was, at least, my personal, invalid experience when working in traumatology. Validated is, however, that it makes a difference in pain reaction, if the partner of the test person is present in a room (Flor 2002). That is, expectation is nothing static but changes according to the environment.

In order to come to reliable and reproducible results about the placebo effect it would be necessary to eliminate all social factors which might interfere with the defined process. But also this would be no solution. In hamsters it has been shown that wounds heal quicker if the wounded is in a normal social context. If the animals were in a tube the wound even became worse (Detillion et al 2004). That is, a wound healing substance might be effective in the first context, but would prove to be a placebo in the second.

Patients in hospitals find themselves often in comparable situations as the hamsters in the glass tube (McCarthy 2004), even more so when a trial is undertaken, where every disturbing factor is excluded. Thus, as it is impossible *not* to communicate (chap. 3.7), it is impossible to exclude the placebo effect by restricting communication.

Furthermore, excluding and controlling everything is bad medicine. It leaves the patient in a miserable state. The results of effectiveness found under these conditions have no significance for conditions where humans are treated in a meaningful social frame.

But expectation is even more complex. A rat which had been fed saccharine-flavoured drinking water that was temporally paired with a powerful immunosuppressive drug, cyclophosphamide, exhibited persistent immunosuppression despite discontinuation of the drug (Ader/Cohen 1975). This means that classical conditioning contributes to the placebo effect, such that previous medication, experience and general habitude alter the outcome of a therapy. The whole socialisation taints expectation.

In Germany 60% of stomach ulcers can be healed with placebos but practically none in Brasilia. But it is nearly impossible to treat German hypertension with placebo, whereas Brazilians react quite well. On the European continent a suppository is much more effective, in England the oral administration is superior (Klein 2003).

A biopsychosocial model for the placebo effect (Roth 2003).has to take into account that every therapy is embedded in a process of signification which influences the outcome and, recursively influences the signification. The results are often as unexpected as contradictory. For example, in Parkinsonian patients there was a verbally induced expectation of increase/decrease of growth hormone and cortisol. This did not have any effect on the secretion of these hormones. However, if a preconditioning was performed with sumatriptan (which stimulates growth hormone and inhibits cortisol secretion), a significant increase of GH and decrease of cortisol plasma concentrations were found after placebo administration. This happened although verbally opposite suggestions were given. (Benedetti et al 2002). That is, the placebo effect was adverse to the expectations but in line with experience or 'body memory'.

### **c) formalisation of the placebo effect**

The basis of current medicine and therapy is that of a *specific disease*, a disease that can be described in terms of a pathophysiology, either on a visible or on a cellular/molecular level (physiological or biochemical pathways, gene expression and so on). In order to treat the specific disease a *specific therapy* is designed.

This creates a frame of observation which is characterized by this specificity.

Everything that is not describable with this approach is *unspecific*. There are unspecific diseases and unspecific therapies. Such unspecific effects are an integral part of every therapy (Walach/Sadaghiani 2002).

That is, a lot happens outside the defined frame of specificity, like conditioning, socialisation, expectation and other, just as seen before. It is impossible to exclude these unspecific factors. The exclusion, as has been shown, is an unspecific factor itself.

*The relation between specific and unspecific therapy is the same as the relation between verum and placebo.* In fact, they are identical only applied to drug therapy That is the content of the most used definition of placebo by A. Shapiro: "We define the *placebo effect* as the non-specific, psychological, or psycho-physiological

therapeutic effect produced by a placebo, or the effect of spontaneous improvement attributed to the placebo” (Shapiro/Shapiro 1907: 12).

The placebo effect happens always in an undefined area. This has to be well understood. The placebo effect is by definition the unexplained. There is no possibility to make statements on the placebo effect as such. Doing this leads to the known problems in the investigation of the placebo effect.

Of course it is possible to investigate certain parameters as pill size and colour, the way of administration and so on. By that these factors become specific leaving other factors in the unobserved state of unspecificity. In investigating ‘expectation’ certain expectation related results will be found. All other aspects will remain undefined.

That is, statements on the placebo effect as a whole are meaningless according to the basic definition of the specific disease.

The unspecific nature of the placebo effect explains the contradicting results seen in placebo research:

- A meta-analysis of placebo-controlled studies, which also included a untreated group, showed that placebos are ineffective and not superior to non-treatment. The placebo group had no better effects than the non-treated (Spiegel et al 2001).
- A meta-analysis of anti-depressive drugs showed that a verum is hardly more effective than a placebo, but both are more effective than non-treatment. (Kirsch/Sapirstein 1998).

The formalization of the placebo effect reveals another weak point in the usual design:

The specific model of a disease leads to a specific therapy.

- The specific pharmaceutical medium is the verum (V).
- All effects that are not specific to its physiological mechanism are called placebo (P).
- But as people are able to recover without being concerned about V and P there is something like spontaneous recovery (S).

This spontaneous recovery is logically a little bit strange. Is it a constant (like the radioactive process of disintegration) or does it depend on unspecific factors, than becoming an element of P? In fact S cannot be distinguished analytically from the placebo effect (Fields/Price 1997: 96-100), though it is something different. The placebo definition of Shapiro has taken this into account, although it is not precise in this regard. Thus, what is normally talked about is the so-called *placebo response* which represents P+S. That is, in the frame of the usual randomised trials no distinction between a placebo effect and a placebo response is possible. The only way

to do this would be to compare it with an untreated cohort.. This has been done, for example, in a meta-analysis of antidepressant drugs. The result was (Kirsch/Sapirstein 1998):

- 25,16 % of the effects can be attributed to the drug
- 50,97 % of the effects can be attributed to the placebo effect
- 23,87 % of the effects can be attributed to the natural history

In order to be regarded as effective, a therapy has to fulfil the following requirement

$$V (+S) > P (+S).$$

In words: The verum – including spontaneous remission – has to be superior to placebo – including spontaneous remission. Or: “Subtracting mean placebo response rates from mean drug response rates reveals a mean medication effect” (Kirsch/Sapirstein 1998).

What does this imply? If we assume a linear process, we can find a lot of combinations. V, P and S might use the same therapeutic principles, work additively, complement or impede each other. This is not only a theoretical construct. For example, it could be proved that the opium and endorphin antagonist Naloxone is able to block placebo induced analgesia (Levine et al 1978). Naloxone antagonizes even placebo induced heart rate reduction, whereas propranolol antagonizes only the heart rate reduction but not the analgesia (Pollo et al 2003).

Theoretically,  $V + P + S$  could be added to create an extraordinary healing process. Naturally the version  $P + S - V = 0$  (the verum impedes self-healing abilities of the body) is also possible and probably quite common. But every other combination is also thinkable.

Assuming linear relations everything can be neatly depicted. There are, for example, diagrams where an additivity of specific and unspecific effects, placebo effect, artefacts and regression is assumed (Walach 1999a).

But: Does all this arithmetic make any sense? Do such diagrams have any semantic meaning? Do such distinctions represent a kind of reality? Does all the agony around the placebo effect represent any truth? Or is it just a result of a certain study design? Playing around with certain vague notions?

#### **d) systems approach and individualisation**

The whole problem of placebo is solved if a different approach is chosen. It must be so as 'placebo' is a result of 'specificity'. In a concept without 'specific disease' the placebo problem does not arise.

In a systemic view the human is an interconnected system reacting to a stimulus or perturbation (chap. 4.8). According to the principles of goal-orientation and equifinality (chap. 4.7), the reaction of the system does not necessarily depend on the initial conditions, nor are the reacting pathways traced out. The system is not concerned about V, P and S. It will react according to the present situation.

That is, the reaction to a defined stimulus might be different in disease A and in disease B, in state A and in state B, in patient A and in patient B. On the other side, the reaction might be the same to different interventions, be it a drug, a placebo, an injection, a verbal suggestion or the smile of the nurse.

The reactions to a placebo are necessarily nontrivial. This is an obligatory conclusion according to systems theory. It is also the result of placebo research of the last years. Stoessl found in Parkinson's disease that placebo induced about the same secretion of Dopamin in the brain as the verum does (Fuente-Fernández et al 2001). This was confirmed by Benedetti et al, who showed that the same region in the brain (Nucleus subthalamicus) reacted (Benedetti et al 2004). Similarly Petrovic found the same neuronal patterns in placebo- and opoid-analgesia (Petrovic 2002). In contrast, Leuchtner proved that anti-depressive drugs (fluoxetine, venlafaxine) induce a different neuronal pattern than the placebo leading to an increase in prefrontal reaction not found in the verum group (Leuchtner et al 2002). This corresponds to findings that cognitive therapy leads to a different neuronal pattern than drug therapy. Cognitive therapy increases activity in hippocampus and dorsal cingulate and decreases it in dorsal, ventral, and medial frontal cortex, whereas drug treatment (paroxetine) dose somehow the opposite (Goldapple et al 2004). As Leuchtner's investigation was made with quantitative electroencephalography and Goldapple's with positron emission tomography, the patterns are not directly comparable. However, the conclusion remains that there are different pathways to recover from a specific disease.

All this shall demonstrate that P, V or S are just theoretical constructs of an observer. They are notions based on an underlying theory, in this case the theory of specificity. These notions reveal a lot about the observer, sometimes even more than about the

observed. This is a typical characteristic for a state where an undecidable question has been decided (chap. 3.4).

## **2.5 The Limits of Evidence Based Medicine (EBM)**

The last decade was characterised by a growing importance of the so called ‘evidence based medicine’ (EBM). This is a medicine strictly based on controlled trials, neglecting personal impression or experience, or even other types of understanding the patient. The main question today seems to be how practitioners and patients can be convinced to follow the results of the 10,000 new randomised trials included in MEDLINE every year. “From best evidence to best practice” (Grol/Grimshaw 2003) is such a slogan. A situation is intended where a physician should be, at best, “remote-controlled by epidemiologists, statisticians, state and health insurances” (Kienle et al 2003, my translation).

But there is increasing criticism with regard to this concept, mostly moderate, sometimes drastic like in the *New Scientist*: “You’d be a fool to believe everything in the papers. Made-up facts, half-baked analysis, hand-picked conclusions - yes, scientific papers can seem no more reliable than the tabloid press” (Matthew 2003).

This chapter will demonstrate that the epistemological problem of medicine is found in evidence based medicine as well, thus restricting its validity.

### **a) the human factor**

First of all there is the ‘human factor’, the obsequiousness of statistics to personal interests.

There is, of course, forgery (DiTrocchio 1993; Haffner/Lukacz 2003; Day 1998b). *Nature* magazine estimates that up to one third of the results are fiddled (Martinson et al 2005). Other estimates using a kind of peer judging suggest an even higher percentage (Fanelli 2009).

Another concern regarding the reliability of trials is the influence of the pharmaceutical industry (Mertens 2001; Moynihan 2003; Healy/ Cattell 2003). The *British Medical Journal* published a series of articles demonstrating the manifold ways of how the pharmaceutical industry influences topics directly, or the medical journals publishing topics, or the journalists’ reporting, or the patients’ organisations



recommending therapies (cf. BMJ 2003b). The former editor of the British Medical Journal even called medical journals an “extension of the marketing arm of pharmaceutical companies” (Smith 2005b). For example, it came out that many articles ‘proving’ the benefit of hormone replacement therapy (HRT) had been written by ghostwriters of the pharmaceutical industry where the mentioned authors contributed little or no writing (Singer N 2009).

Industry sponsored results are much more likely to be positive. Negative results are mostly not published (Meier 2004). Rarely a medical journal attacks results of the industry openly, as the *Lancet* did (Lancet editorial 2003). And rarely cases come into public how the industry tries to suppress undesirable outcomes (Baird/Thompson 2002, Savulescu 2004). Everybody is free to imagine how big the iceberg under such tips really is. There has been an attempt to improve the situation with an international committee registering all conducted clinical trials (De Angelis et al 2004). But after five years it still does not work (Mathieu et al. 2009).

Whether the situation will change through more law suits against pharmaceutical companies (Dyer 2004) cannot be predicted. The strategy of the pharmaceutical industry is to continue to advertise and sell drugs even when something has been scientifically proved to be harmful. And rarely political action is taken (Marmot 2004). Pfizer even continued to sell a drug, although already fined for illegal promotion (Lenzer 2004). Pharmaceutical companies bribe doctors (Harris 2004) and influence the medical market on all levels (Harder 2005). On conferences no speakers are admitted without the approval of the sponsoring drug companies. “Lectures are given on the same topic by the same speakers all over the world for years, and the free debate and exchange of contrasting opinions is, de facto, banned. It was not the same 20 years ago, but in the past 15 years this trend has become a rule, to the damage of medicine and freedom” (Vento 2002).

Another problem is the frequency of statistical mistakes in published studies. An analysis of papers published in *Nature* and the *British Medical Journal* showed that there were mistakes in up to a third of the papers, altering the significance in at least 12% of the papers (Garcia-Berthou/ Alcaraz 2004). As this concerns journals with a very high standard, where even statisticians control the papers to be published (Abbasi 2004), there seems to be no possibility to avoid this. It is to be expected that in journals with lower standards more faults occur.

In the cases where drugs have no major difference to the placebo, as, for example, in antidepressive drugs (Kirsch/Sapirstein 1998; Leuchter et al 2002) the results are manipulated with tricks (Pirisi 2002; Basskin 2003), or it is worked with percentages such that the results look impressive although the real effect is minor (Gigerenzer; Gigerenzer/Edwards 2003).

All this demonstrates that the presented knowledge is by no means objective or scientifically sound.

### **b) evaluation and validity**

The question of accuracy and validity is a mostly settled issue (e.g., Sackett/Haynes 2002, Bland/Altman 2002, Irwing et al 2002). EBM is investigated philosophically (Sehon/Stanley 2003) and has its own journals (*Evidence-based Medicine, Evidence-Based Mental Health, Evidence-Based Nursing*). But all discussion is done in the framework of the given paradigm (chap. 3.10), of decidable questions (chap. 3.4). The gaps of uncertainty inherent in every scientific approach just don't appear. This is why proponents of EBM are convinced to provide the best evidence available and that "physicians who violate its precepts should ultimately face license suspension" (Muney cited in Sehon/Stanley 2003). But such explicit opinions do not alter the fact that EBM is characterized by immense epistemological inconsistencies.

First of all, the evaluation of a diagnostic processes is often not accurate (Knottnerus et al 2002). The more complex the diagnosed behaviour is (hyperuricaemia versus depression) the less valid the descriptions. For 'grief' (classified according to DSM-IV or ICD-10) exist a lot of different models, though no valid or operationable statements are possible (Kersting et al 2003). Validity arises only if studies concentrate on a few parameters. But this is accompanied by a loss of validity for the observed behaviour. It cannot be other when complexity is investigated with a two-valued logic. That is, a therapy might be well established. The question is only for what and whom?

### **c) validity and the consequences for practice**

'Pragmatical trails' (Godwin et al 2003) and cohort studies (Gurwitz et al 2005) have been introduced because normal RCTs are only true under ideal conditions but are of reduced value under other conditions: "Controlled clinical trials of health care interventions are either explanatory or pragmatic. Explanatory trials test whether an intervention is efficacious; that is, whether it can have a beneficial effect in an

ideal situation. Pragmatic trials measure effectiveness; they measure the degree of beneficial effect in real clinical practice. In pragmatic trials, a balance between external validity (generalizability of the results) and internal validity (reliability or accuracy of the results) needs to be achieved” (Godwin et al 2003). But pragmatic trails and cohort studies do not solve the basic problems of trials.

Even an effective remedy will fail, if it works only in a few patients. ”A weak effect with little variability is ‘significant’, whereas a strong effect with considerable variability may not be” (Spiro 1997: 43). Even if a remedy has strong effects but is investigated for other purposes, there will be no result. Viagra failed to prove effective in an angina-pectoris-trial. Only the refusal of the test persons to return the drug and a burglary at Pfizer made it clear to the drug company that they had ‘potent’ drug (Blech 2002). But this was – as in many cases – a result of an observation and not of scientific research. Only the follower drugs, such as Cialis or Nuviva who copied the prototype, are based on scientific research.

That means: if one or several trails find that a remedy is not more effective than a placebo this does not mean that the remedy is ineffective. It means that it is ineffective under the conditions of investigation, or at least not very often or not the way it was measured or not according to the therapeutic model.

Negative studies often result in the prohibition of a remedy. Or it is no longer paid by the national health insurance. But what does this help? In the case of mild drugs – as many herbal drugs – nobody has expected a big difference to the placebo in the first place. When they are not prescribed anymore, ‘stronger’ drugs, i. e., drugs with a higher incidence of side effects (and more expensive drugs) will be prescribed. This happened in Germany, when after a reform of the health system in 2004 all over-the-counter drugs, were not covered anymore by the national health system (Ring et al 2004). As a whole, the result is not better but worse for the patient (Ernst 2003b). EBM is in a certain range of medical problems neither scientifically valuable, nor helpful for the patient, nor economically reasonable.

#### **d) lack of significance and predictability**

Even if studies are carried out correctly the question remains whether their results are true for a given population. The *Simpson paradox* says that probabilities that are true for two populations might be no longer be true for the two populations together (Bogomolny; Malinas/Bigelow 2008). If something is statistically good for men and

good for women, it might be as well be bad for people (Baker/Kramer 2002). Or if A bests B and B bests C in different randomised trials the conclusion that A bests C is a fallacy (Baker/Kramer 2002). As a study provides only valid results for the population of the study, it is of restricted value for any other population. E.g., the predictive accuracy of the Framingham study, which is solid and large, overestimates the coronary risks assigned to the individuals of the United Kingdom (Brindle et al 2003). All conclusions made on the basis of the Framingham study are only true for Framingham in this period of time. For any other population it is but a hint. “You must be careful in extrapolating from the results of trials done in selective patients, mostly in the United States, to the real world and most other countries” (Chaner in Smith 2004b).

Radical critics (Beck-Bornholdt/Dubben 2003) declare medical research based on statistics as deeply dubious. They formally prove that the probability of error for a study, although high, is not ascertainable at all. According to them, statistics lead medicine into a dead end. Other critics argue similarly showing that significance and probability of effectiveness have nothing to do with each other and that results are extremely vague (Weihe 2004).

This can be translated into medical practice:

- the ALLHAT study on hypertension determines the most effective drug but gives no help in finding the adequate preparation for a certain patient,
- the MADIT study makes clear statements for Caucasian males between 55 and 75 with coronary heart disease, complex ventricular arrhythmia and implanted defibrillator (Niroomand 2004). But how many of these patients are we in charge of?

Furthermore, there is no individual predictability in statistics. Beck-Bornholdt and Dubben state: “Large numbers show a statistically exact result. But nobody knows for whom it is the case. Small numbers show a statistically unsuitable result, but we know whom it concerns. Difficult to say which kind of ignorance is more useless” (Beck-Bornholdt/Dubben: 218, my translation). These doubts are also shared by other statisticians and scientists (Gigerenzer 2003, Bagshaw/Bellomo 2008, Kienle 2008), although their criticism is mostly more decent.

Cluster trials (Bland 2004) try to balance the mentioned disadvantages. But as the problem is not technical but epistemological, such a solution will not provide more sound results.

As statistical results are already of limited use for a single disease, they are even less useful in complex diseases. “Many patients in primary care have two or more diseases, even without a common biological basis (comorbidity or multimorbidity), which is particularly the case in elderly people--78% of the population aged 80 years and older. These coexisting disorders typically do not have a biological link, but nevertheless affect treatment. What is the evidence to follow in the management of an 82-year-old patient with chronic obstructive pulmonary disease and type 2 diabetes, because treatment with corticosteroids could interfere with control of glycaemia?” (Messeneer et al 2003).

### **e) time and process**

Many studies have the problem of short duration. Longer observation might find other outcomes than the initial results suggest.

- 1) A study on epicondylitis shows that an injection with cortisone has immediately the best effect. However, in longer observation it is less effective than physiotherapy or just doing nothing (Smidt et al 2002, Bisset et al 2006).
- 2) A study on baby walkers shows that the use of walkers brings babies earlier in an upright position, but they learn later to walk and stand alone (Garett et al 2002).
- 3) Babies treated with antibiotics during the first 6 months of their live have a higher probability to develop allergies or asthma (Johnson et al 2005).
- 4) Preterm babies fed with a nutrient-enriched diet had a higher insulin resistance in adolescence as in babies fed with lower-nutrition diet such as banked breast milk or a standard formula (Singhal et al 2003; Singhal et al 2004). As a result: Feeding babies up quickly is not as healthy as slow development, although reference values are not reached as soon.
- 5) Breast-fed children show a higher levels TC and LDL values. After adolescence however the concentrations are lower than in children not breast-fed (Owen et al 2002).

Already the duration of the last studies exceeds the time frame of most studies on which our knowledge is (evidence) based. If the principle ‘helps short term – harms long term’ is more common than short studies would be an instruction for damaging.

#### **f) surrogate parameter**

RCTs investigate parameters. These parameters might be irrelevant for the expected outcome or for overall health, although obviousness based on reductionist research suggests something different (Ledford 2008). A classical example is sodium fluoride which raises bone density but makes it more brittle (Riggs et al 1990) (chap. 4.6).

This is why large studies regularly give rise to surprises turning away from widespread treatments which were induced on the basis of small studies. The CAST study (Echt et al 1991) proved more deaths through antiarrhythmics as through placebo. The WHI study (Chlebowski et al 2003) showed more breast cancers, more strokes, more thrombosis through hormone replacement therapy with oestrogen and progesterone in postmenopausal women, the standard therapy for many years. It also is correlated to a higher incidence of newly diagnosed asthma (Barr et al 2004).

Similar risks are also true for monotherapy with oestrogen (Women's Health Initiative Steering Committee 2004). A year before the WHI study was published an editorial of *New England Journal of Medicine* stated under the header "Good news about oral contraceptives": "The development of oral contraceptives stands as a major advance in women's health in the past century" (New England Journal of Medicine editorial 2002), as a study (CASH study) did not show any increase of breast cancers through HRT. But already then there had been trials showing the severe side effects of hormone replacement therapy, although some of them had not been published (McPherson 2004, McPherson/Hemminki 2004). Today's scientific knowledge is: "Postmenopausal therapy with estrogen and progestin results in increased risks of disease, does not make asymptomatic women feel better, and does not improve cognition. There is no role for hormone therapy in the treatment of women without menopausal symptoms" (Grady 2003). This is quite a contrast to the knowledge of a few years before.

Presumably there are other harming drugs in use, widely described by physicians where a beneficial effect is proved by the means of EBM.

#### **g) rare side effects**

Side effects, even fatal, are quite common and highly underestimated. Estimates judge that in Sweden fatal side effects even sum up to 3% of all deaths in the general population (Wester et al. 2008). The situation might be worse in countries like Greece or France where drug consumption is much higher (Mölstad et al 2002). Only about 6

% of the adverse effects are related to the medical treatment (Ebbesen et al 2001, Schnurrer 2003). Mostly they are not brought into connection with a certain therapy (Cuervo/Clarke 2003).

Often severe side effects are not detected by RCTs but by observation, as rhabdomyolysis through Baycol/Lipobay (Vandenbroucke 2004a). Trials to prove or disprove side effects are normally initiated only if there is a certain suspicion as with acute myocardial infarction through COX (cyclooxygenase-2) inhibitors (Solomon et al 2004). But in this case it happened after more than 80 million patients had taken this drug (Topol 2004) and a lot of RCTs proving the effectiveness of COX inhibitors had been published.

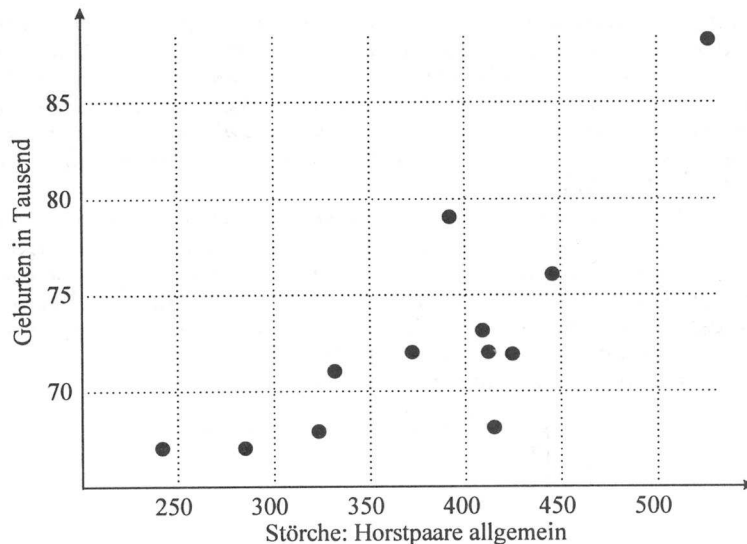
As rare side effects, according to the non-trivial status of man are often not predictable, RCTs are not helpful (Vandenbroucke 2004b). In contrary, rare side effects slip through the meshes of statistical evaluation. EBM is a tool to dilute the appearance of rare side effects and make them seem as accidental. It took about 100 years to find a correlation between aspirin and pancreatic cancer in women (Schernhammer et al 2004) as this cancer is quite rare and no model had been developed to correlate the two. In contrary, findings in hamsters and *in vitro* suggested that aspirin has an antineoplastic effect on pancreas (Baron 2004). Even the prevalence of Aspirin induced asthma is much higher than expected before (Jenkins et al 2004). As this concerns one of the most used drugs in medical history, one could have expected that its side effects are well known. But this is not the case.

Another reason for the inability of RCTs to discover side effects might be that most studies exclude persons disposed to suffer side effects (e.g., old persons) which in general practice are treated with the drug (Dieppe et al 2004).

Moreover, the effect of the combination of drugs is rarely investigated, although they are common use. In a study with more than 7000 cardiovascular patients taking aspirin, the additional consumption of ibuprofen (common in practice) correlated with an increase of 50% of deaths in eight years (MacDonald/Wei 2003).

### h) arbitrary causalisation

Statistics produce data, correlations, but never causal relations. In economy the reciprocal relation between skirt length and economy growth (the *hemline index*) is so well established that quite a lot of economists believe in it (Schultze 2008).



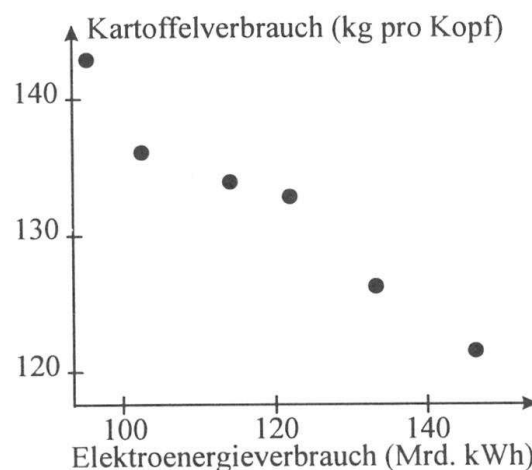
Storchenpopulation und Geburten in Niedersachsen (1972 bis 1985)

The standard example in statistic literature is the correlation between the storks and births. Here we see that the decline of storks in the years 1972-1985 in Lower Saxony correlated with the decline of births in this period of time (Schwarze 2001:

18). If we still believe the model of the stork bringing the babies, the meaning of this statistic is obvious to us.

Not so obvious but more scientific, as the parameters are specified in a metric system, is the correlation between the consumption of potatoes (in kg per person) and the consumption of electric energy (in bill. kWh). This correlation (Schwarze 2001: 18) is so accurate that it can't be

accidental. But again we are not inclined to see this correlation as causal. We will use other mechanisms to explain it. Or take this: Turkish children in Germany suffer about half as often from asthma than their German counterparts. However, the more the Turkish families adopt a



German life style the more the incidence approximates the German figures. The best correlation is the language spoken. The more the Turkish family speaks German the higher the incidence of asthma (Swaf 2006).



In this category might also fall the correlation between fetal femur size and blood pressure at the age of 6 (Blake et al 2002) or: “Women who change partner between their first two births are at an increased risk of delivering a preterm, low birth weight baby with an increased risk of infant mortality compared with women who have the same partner for both births” (Vatten/Skjærven 2003). When left-handers face a greater cancer risk theories are developed that some hormone-like chemicals during pregnancy provoke both: the status of a left-hander and the risk becoming cancer (Khamisi 2005).

And what are we doing with the Caerphilly study (Ebrahim et al 2003) that showed that men shaving less than once a day had an increased incidence of stroke (70%) and generally a higher mortality (30%). The authors did not succeed in finding other factors to explain this correlation.

As the Caerphilly study was a large study (2.438 men observed over 20 years) we have to take the results seriously. What should be the consequences of this finding? According to the usual procedure shaving machines should be provided by the national health services of each country. Education campaigns should be initiated promoting the beneficial effects of shaving. It should be thought of – and tested in small studies – whether or not depilatory creams are useful, as it might be assumed that the beard creates health problems.

What sounds at first as satirical is nothing than the real satire of every day medicine. Normally we do not realize that the therapeutic strategies taken on the ground of statistics are on the same level as the strategies presented here for the Caerphilly study. As the subject is mostly diabetes or lupus erythematosous it is not so striking. Men who experienced the Leningrad siege have higher systolic and diastolic blood pressure and excess mortality from ischaemic heart disease and stroke. This was attributed to starvation (Sparen et al 2004). There were, however, quite a lot of other factors during the siege of Leningrad that might have affected health and one of the authors stated in the following discussion more precisely that the problem was the “trauma of the siege” (Vågerö et al 2004).

Television is associated with obesity in childhood (Stettler et a 2004). Nobody would believe that there is a causal relationship. But when childhood exposure to cigarette smoke is associated with a higher risk of back pain in later life, the authors see a causal effect of the smoke on the developing spine (Eriksen 2004).

These are only some of the dubious causalisations the information services present us every day. But also all other causalisation happens at one's own discretion. Evidence is always an 'evidence of obviousness'. It produces what an external frame, a legend (chap. 3.8) or a paradigm (chap. 3.10) allows to. A statistic is just able to make a hypothesis more or less plausible. Nothing more. *To believe that statistics produce knowledge is like hunting Easter eggs oneself has hidden* (Simon 1993: 31).

Sometimes we have the opposite: After the first meta-analysis for homeopathic treatments showed its effectiveness (Linde et al 1997) there were statements like: "More importantly yet, if the basic sciences gave us very strong reason to believe that a drug would *not* be effective, then it is appropriate to be very cautious when interpreting apparently positive clinical results" (Sehon/Stanley 2003).

In fact, we should always be cautious when interpreting apparently positive clinical results. And we should be aware that all interpretation of statistics is arbitrary and "an open debate" (McCromack/Greenhalgh, 2000; Coradi/Taylor, 2003).

### **i) conclusion**

Taking all aspects together it can be shown that "most published research findings are false for most research designs and for most fields" and the results may often be simply an accurate measure of the prevailing bias (Ioannidis 2005). „Randomized trials 'are very good for showing that a drug does what the pharmaceutical company says it does,' said David Atkins, a preventive-medicine specialist at the Agency for Healthcare Research and Quality, 'but not very good for telling you how big the benefit really is and what are the harms in typical people. Because they don't enroll typical people'" (Taubes 2007).

Rarely a therapy has been tested so intensively as hormone replacement therapy. But even here, or especially here observational studies contradict randomised trials and a minute investigation shows that the influencing factors are so numerous that no definite answer is possible (Taubes 2007). At most, very prominent relations like smoking and lung cancer can be convincingly established thorough trials.

Therefore, the translation of statistical evidence into medical practice has to be made with a lot of care and a fair bit of doubt, as too often the truth of today turns out to be a mistake tomorrow. „Evidence based practice is not practice directed by research evidence. Evidence based practice is the judicious use of research evidence, based on a clinician's expertise and experience, in light of the patient's

preferences. Research evidence does not supersede the challenging role of the doctor in clinical decision making, but it can support it. Just as diagnostic tests provide additional, helpful information but don't dictate patient management, research evidence provides further, hopefully useful information, but can't and shouldn't dictate practice. As both a patient and an evidence based practice researcher, I fervently hope that doctors still observe and think" (Turner 2004). Bernard stated, nearly 150 years ago: "It is said that coincidence may play so large a part in causes of statistical errors, that we should base conclusions only on large numbers. But physicians have nothing to do with what is called the law of large numbers, a law which, according to a great mathematician's expression, is always true in general and false in particular" (Bernard: 138).

## 2.6. The Magic of Reference Values

Another example of an epistemological inconsistency is a phenomenon which I would like to call the *magic of reference values*.

In medicine we have a lot of individual measurements. Normally they are distributed according to a Gauss distribution. By calculating the standard deviation (SD) or by a different method certain limits are set. These limits do not concern 'essential variables'. That is, a change beyond the defined limits does not change the behaviour of the organism (Ashby 1960: 36), nor does it endanger its existence (Ashby 1960: 41-43). Thus, the stability of the whole system cannot be assigned to any of these normal values.

In contrary, the vigorous activity of a certain variable might be meaningful for the organism and can result in a stable whole (Ashby, 1960: 56). Fixing this variable may be harmful (chap. 6.4; 6.7) and lead to a vigorous activity of other variables (Ashby, 1960: 67).

To make a clinical example: A value, often 'altered' and mostly treated is blood iron. Naturally there are studies supporting this view. Patients, mostly women, with a modest iron 'deficiency' did much worse on attention, memory and learning tests than those with enough iron in their blood (if we suppose it to be a relation and not only a correlation). "But women should not rush to take iron supplements as about one in 20 people of Anglo-Saxon origin carry a gene for "iron overload" or heredity

haemochromatosis” (Bhattacharya 2004). That is, such a therapy might be harmful to a certain sensitive population

But reduced iron might also have a meaning. “Early in bacterial infection, iron becomes more tightly bound to protein, and is removed from circulation by the liver. From an adaptive point of view, the response is beneficial to the host because the bacteria need a plentiful supply of iron to thrive. Together with fever, low levels of iron help to fight the infection. And yet this 'deficiency' is often treated with dietary supplements, thus prolonging the disease process” (Lewin 1993).

A similar effect is seen in cancer which is mostly accompanied by anaemia. Epoetin  $\beta$  ‘corrects’ anaemia but does not improve cancer control or survival. Disease control might even be impaired (Henke et al 2003). There is also some indication that iron reduction through regular phlebotomy is able to reduce cancer risk (Zacharski et al 2008).

Moreover, high dietary iron was linked to Parkinson’s disease (Powers et al 2003), too much of intracerebral iron might be a cause for multiple sclerosis (Bakshi et al 2002) and higher iron stores are associated with an increased risk of type 2 diabetes (Jiang et al 2004).

What are physicians doing in prescribing supplementary iron in pregnancy, in early childhood and all along the way, just on the basis of low ferritin? Such a treatment of reference values might be rather harmful for the patient, although not immediately. The reference values have to be seen in their context. What meaning has a haemoglobin of 11, 2 mg/dl for a female vegetarian, who exercises regularly? The Berlin vegetarian study (Rottka et al 1988; Rottka 1989) proved that, in fact, anaemia was quite common among vegetarians. But they were generally in a better health condition. Of course, vegetarian life facilitates anaemia, even with clinical signs. But other life-styles have other dangers. The subclinical anaemia found in many vegetarians might have no meaning for their health. It might be regarded as an accidental finding not as a state to be treated.

That is, it is not so easy to judge the meaning of all the measurements we are confronted with. This is especially true for all the new markers without established clinical importance yet (Manolio 2003).

The unreflected administration of substances like iron, minerals or vitamins just to provide a ‘necessary quantity’ or as a therapy comes lately under fire. More and more

side effects are observed (Parker-Pope 2009a). For example, vitamin A intake is correlated to more fractures (Lips 2003; Michaëlsson et al 2003) and beta carotene, vitamin A, and vitamin E may increase mortality (Bjelakovic et al 2008).

Around 1980 bilirubin concentrations in newborn over 14 mg/dl were treated with phototherapy, concentrations over 20mg/dl lead to exchange transfusions.

“Unfortunately, the early 1980s was not a good time to be transfusing blood in San Francisco. Although we did not know it then, the blood supply was contaminated with HIV. We also did not know that most of these exchange transfusions were unnecessary.” There was a ‘fear of twenty’ (vigintiphobia) for kernikterus (Newman 2003) (chap. 3.9). This fear led physicians to hold bilirubine levels low. However, bilirubine is a metabolite of biliverdin which is a potent cytoprotectant and might be of benefit for newborns (Barañano et al 2002).

Of course, this is an old story and we know better now. But we should be cautious. Comparably harmful treatments probably happen today, as well. They happened throughout all the history of medicine. For example, today’s intensive care in its attempt to control human physiology by drugs in order to promote a ‘better’ function might do more harm than good. If true, and there is strong evidence (Singer/Glynn 2005), this would be another example of how the overemphasis of certain reference values is not beneficial.

What has to be kept in mind is that all these limits are somehow arbitrary. They are helpful in judging the patient. Without doubt. But there is a danger to give them a signification (chap. 3.9), such that *the description becomes a prescription*, a point of intervention.

Just the way the police will fine someone who exceeds the speed limit, the physician then will fine a patient with a treatment if he exceeds the 2 SD limits of the standard deviation. But, in contrast to the police, the physician will sometimes intervene if the measurements only approach the limits (“your values are quite low” – that means ‘normal’).

## 2.7 The Meaningless Value

If we focus our attention on the basic item of medicine, the individual value, we are again caught in logical problems. Two examples:

If someone is tested HIV positive (ELISA and Western-Blot with a specificity of 99,99%), is the person infected? Our normal understanding would say, yes with a 99,99% probability. But this is not the case. Actually we have no idea whether the person is infected or not. The probability depends on many factors, especially whether or not the patient has a risky life concerning AIDS. Out of 10.000 men not belonging to a risk group it can be expected (based on clinical knowledge) that one will have AIDS. This man will be tested positive (99,99 % probability). Of the other 9.999 men not having AIDS also one will be tested positive (false positive rate). So the probability that a person out of a non-risk group tested HIV positive has AIDS is about 50% (if our basic assumption is correct). If in a group of 10.000 homosexual men 150 have AIDS, these 150 will be tested positive (99,99 % probability) and of the remaining 9.850 non-infected men one will be tested positive (false positive). The probability that a man tested HIV positive will not have AIDS is 1 out of 151 that is under 1%. So if a man out of a non-risk group is tested positive the probability of having AIDS is about 50%, for a man out of a high risk group it is over 99%. Two men, two positive results, but totally different probabilities. (Gigerenzer: 163-197). A 65 year old patient with a history of long and heavy smoking, diabetes, hypertension and hypercholesterinaemia and a 35 year old woman with atypical symptoms of angina with a positive anamnesis but lacking other risk factors make the same day an exercise ECG that shows a horizontal ST - segment depression. Although the test provides an identical result, the probability of a coronary heart disease is much higher in the first case (Niroomand 2004).

What we see here is the fact that the value of a value does not only depend on a correct measurement. Its meaning depends largely on the circumstance under which the person lives. The value as such is meaningless (chap. 3.1).

It is the typical relation between the frame and the content (chap. 3.6). It is always the frame which decides on the meaning. Simultaneously the frame (the reference values) is defined through the distribution of single values. That is, the meaning of a value is determined by the frame it constitutes. This fact, approximately depicted by Escher's *Drawing Hands*, is a typical result of the recursive nature of all living.

## 2.8 Complexity

Complexity is the main characteristic of our world and it is probably the most common word used to describe biological phenomena (Alon 2007). Despite this fact, there is no generally accepted definition and the so-called science of complexity is mainly an amalgam of methods, models and metaphors from a variety of disciplines rather than an integrated science (Heylighen 2008: 3). Known is, however, that a central characteristic of all these 'complex adaptive systems' (Holland 1996) – of which the human is one – is their nonlinear, unpredictable and uncontrollable behaviour (Heylighen 2008: 2).

In medicine there are many situations, especially in hospital, where the knowledge of the principles of complexity is of minor interest. An appendicitis, a broken arm or a suicidal ingestion of drugs can be handled according to simple patterns. But outside this strict frame an understanding of complexity management is crucial for the practice of medicine. It is not necessary for the practitioner to know about the technical details. He must only know how these principles translate into medical practice. In contrary, the scientist aiming to develop models and therapies should have an understanding of both – the epistemology and its translation into practice. The following examples shall demonstrate how complexity occurs in medicine without referring, at first, to related theoretical concepts except of the notions of nonlinearity and polycontextuality.

### **a) the non trivial nature of nutrition**

Bircher-Benner (1867-1939) observed at the beginning of the 20<sup>th</sup> century that a healthy diet was helpful in many diseases. For rheumatism he introduced a diet without animal products. This should last one month, at least. Until recently this was regarded as pure mysticism.

Lately it could be proved that the archidonic acid plays a major role as a mediator of inflammation in RA. It is mainly present in animal fats, and, as Bircher-Benner had already observed, the depots of archidonic acid are depleted after about four weeks leading to a decline of the inflammatory process (Sandmann/Ollenschläger 1996). Bircher-Benner's only mistake was to attribute the effect to animal protein and not to animal fat. But this is of no importance under natural conditions, that is, if the treatment is a healthy diet.

But the physiological model did not change the therapeutic attitude. If any drug would have had the same anti-inflammatory potency as the abstinence of animal fats the result would have been published in all major medical journals. It would be seen as a medical breakthrough and would be promoted, especially by the producing pharmaceutical company. But as the therapy is not drug based it is rather neglected. This is one aspect. Another aspect is that a diet rich in animal fats does not only rise arachidonic acid, but other parameters as well, such as cholesterol (McDougall et al 1995) and it even increases the probability to develop type 2 diabetes (Song et al 2004). Under the current paradigm any of these problems is treated with a different drug.

Complexity arises here on two levels. One is that a diet low in animal fat and protein is helpful in 'unrelated' diseases (Fung et al 2008). The other is that value decisions influence the evidence and knowledge of physicians who might use different therapeutic strategies. A first order question would be to decide whether Atorvastation is effective in the treatment of hypercholesterinaemia. It is a second order question (chap 4.3) to decide what kind of therapy should be chosen (drug vs. diet).

There are, of course, also studies showing the value of meat. In an – obviously extremely biased study – 544 children, who had an average age of seven years, were given two spoonfuls (about 60 grams) of minced beef each day to supplement their ordinary diet. Other groups were given a cup of milk, an equivalent amount of energy as vegetable oil, or no supplement at all. In the group without meat, children grow up smaller, less strong and less intelligent. The authors concluded that the benefits were so clear that denying children meat would be unethical (Allen 2003).

With nutrition and '*nutritionism*' (the treatment with defined substances or the supplementation of water, flour or other products) we enter a rather dark chapter of medicine. It has a lot to do with financial interests, lobbyism and the dependency of governments on pressure groups (Pollan 2007). But nutritionism is also an expression of reductionism. Food research found and still finds numerous 'important' factors. To administer all of them in a natural way, that is, through food, would necessarily lead to obesity. What can be done? According to the current paradigm the ingredients are given purified as a defined drug, from fibres, over vitamins to essential elements. But this is a flawed process. First of all, we have no idea what the human really needs. Continuously new substances seemingly important for a healthy diet are detected. Second, there is little evidence what happens, if all the substances are given together,



or if certain substances are not included. As a result, everything is promoted as healthy and given plenty of it. This makes logically no sense, in the first place, and newer findings suggest that this strategy is not really beneficial. Vitamins and supplements seem to have the tendency to do more harm than good (Palmer et al 2003; US Preventive Services Task Force 2003). Here are two deliberate examples:

- Based on experimental and epidemiological data vitamin E was promoted as protective for cardiovascular disease. However, it showed a higher incidence of heart-failure (HOPE 2005) and an increase all-cause mortality (Miller et al 2005).
- Antioxidants are known to be helpful in protecting cancer. But the administration of antioxidant supplements for the protection of gastrointestinal cancers is not effective and may be even harmful (Bjelakovic et al 2004).

That does not mean that a nutrition rich in these substances is ineffective or harmful. These studies only prove that the linear concept of nutritionism is not appropriate in dealing with the complexity of nutrition.

Another example is the current fashions of folic acid. Its effect has been established in many trials. Folic acid became a widespread supplement. In the US and Canada the flour is enriched. This is associated with a decline in spina bifida of 78%, from 4,36 to 0,96 in thousand births (Liu et al 2004b). This is, in fact, impressive even in absolute numbers. However, the result was established in a region in Canada with a high incidence of spina bifida and with a growing incidence since the seventies. In Canada as a whole the reduction was less, from 1,16 per 1000 births to 0,75 per 1000 births. We do not know why in one special region of Canada spina bifida became so high. If it was not a lack of folic acid, the 'cause' might lead to other harmful effects in the humans concerned and fortification would lead to a phenomenon called suppression (chap. 6.8). The question is also why in other regions (in a different context) folic acid should be supplemented.

Nobody knows the long term effects of a consequent folic acid substitution, especially as the substituted form pteroylmonoglutamate (PGA) does not occur in nature (Lucock 2004).

As folate is "involved in so many of life's fundamental processes nobody knows the long term effects of exposing whole populations to the unnatural folate. There is thus great potential for good, some possibility of harm, and much uncertainty.

The question of fortifying foods inevitably becomes highly political, and the politics of nutrition are just as complex as the science” (Smith 2004a).

The amount of PGA administered with folic acid fortification exceeds the ability of the liver to metabolise it. Unmetabolised folic acid floats around the blood stream which might have severe side effects, probably for people being treated for leukaemia and arthritis, women being treated for ectopic pregnancies and men with a family history of bowel cancer (Anthony et al 2007). It also has been found to increase the risk of re-stenosis after coronary stenting – against expectations according to physiological models (Lange et al 2004). Some even fear a genetical selection with negative consequences for the future (Lucock/Yates 2005). Also all cause mortality was about a fifth greater in women with high doses of supplemental folate, and the risk of deaths attributable to breast cancer was twice as great (Charles et al 2004). Another study found that the incidence of breast cancer was lower in these women who drank regularly alcohol and took folate (Baglietto et al 2005). An accidental correlation or a causal connection?

In this atmosphere of autistic – undisciplined thinking many different opinions prevail as demonstrated by BMJ. They range from: “Folic acid fortification remains an urgent health priority” (Oakley/Mandel 2004), to: “Let food be thy medicine and medicine be thy food” (Smith 2004a).

The nutrition discourse might become sounder when certain epistemological principles are applied. First, the context under which a certain intervention is investigated has to be defined more clearly. This shall be demonstrated with the following example: It has been shown that multivitamin preparations slow down the progression of HIV- patients receiving antiretroviral drugs (ARV) in an African region where patients have no safe water or food (Fawzi et al 2004). There is, however, no hint that multivitamins are helpful under any other circumstances. An equivalent therapy would be to provide better social conditions and some Africans demand: "If you give us ARVs, please give us food, just food." (Marston /de Cock 2004). Do not give multivitamins. Again, we see a second order problem, as there is no reason, at first, to choose the multivitamin or the food option. Is the aim to treat HIV? To improve general health? To promote certain therapies? At which cost? There are also serious voices expressing the concern that giving food only prolongs the misery of Africans. Are their arguments applicable here? This is a complex situation in many regards.

Mediterranean diet is attributed to health and longevity. Reductionist research suggests many factors, from essential fatty acids to vitamins to be 'causal' for this finding. But, who ever saw the practical life in Mediterranean villages before 1970 knows the most important characteristic of the Mediterranean diet: there was very little to eat. A proverb says: A donkey would starve, but two Greeks can live from it. And these people with an already a low intake of so many factors that current science regards as essential also fasted several times a year out of religious reasons. This might even be the main 'cause' for the effectivity of the Mediterranean diet (Sarri et al 2004), as animal research claims that calorie restriction is the main measure to induce health and longevity (Roth et al 2004). This reflection refutes already simple linear assumption, but the posed problem is even more complex.

In malnourished rats with a severe lack of vitamins the symptoms of avitaminosis vanished if certain components are further reduced and reappeared if the components are given again (Kollath: 38). Or: In rats with experimental rickets the administration of Calcium might lead to more severe symptoms, even in presence of vitamin D (Kollath: 161). That is, in malnutrition a supplement thought of to be beneficial might be harmful. Unexpected events appear where a lack of events or the vanishing of events was expected.

Kollath's results remind a little bit the 'excesses' described by Sacks in neurology (chap. 2.2). Unexplainable reactions arise all over in our medical practice – when looked at carefully enough and are due to the nonlinearity and unpredictability of complex adaptive systems.

When we go back to the malnourished Africans suffering from AIDS and receiving multivitamin drugs or to the women drinking alcohol and taking folic acid, and ask whether these interventions are helpful, the answer is rather simple: we just do not know. Reductionist experiments and statistical trails are not able to give decisive answers.

### **b) the bacterial flora**

Closely connected to nutrition is the gut flora which came into the centre of scientific interest lately. The gut flora contributes to the host's nutrition by providing carbohydrates, amino acids and vitamins (Gilmore/Ferretti 2003). By that it regulates fat storage and even might be connected to obesity (Bäckhed et al 2004). Every kind of nutrition has its own flora with its own characteristics. The intestinal flora consists

of about 1,2 kg bacteria and is so complex that not two people have the same complement of bacteria (Abott 2004). These micro-organisms adapt to each other and to the host even by exchanging genetical material (Xu et al 2007).

To really judge the importance of the gut flora, its organizational purpose has to be understood. The intestines are the most pervious part of the body. In the guts the distinction between me and other is problematic. Food has to be reduced to a size that the autopoietic unit 'human' (chap. 4.8) is able to absorb it and to maintain simultaneously its autonomy.

This happens in cooperation and in a symbiotic exchange relation with many bacteria. That is, the human is here in a very close contact with a multitude of bacteria that are potentially harmful. The mechanisms how this shifting balance between helpful and harmful bacteria is performed are slowly investigated (Xavier/Podolsky 2000; Neish et al 2000; Podolsky 2002; Ganz 2003; Coye et al 2005).

Immune regulation and inflammation processes are closely involved in this process. Thus, the gut flora plays an important role for the immunological balance (Podolsky 2000), might influence allergic disposition (Noverr et al 2005), is the first line of defence against pathogenic bacteria (LeBlanc et al 2008) and even might prevent kidney stones (Kaufman et al 2008). It is an ecological system with all characteristics of complexity.

When *Helicobacter pylori* infection was found to be related to stomach ulcer, this led to a shift of paradigm in the treatment of the disease. Till then stomach ulcer was a typical 'psychosomatic' disease. Today *Helicobacter* is seen as the leading cause even of gastric malignancies (Kawakubo et al 2004), although it is inadequate as a monocausal explanation. Only a fraction of the 'infected' patients develop peptic ulcer, gastric cancer, or malignant lymphoma (Kawakubo et al 2004). The lifetime risk for persons with *Helicobacter pylori* to suffer peptic ulcer ranges from 3 percent in the US to 25 percent in Japan. Life style factors are still as good to predict peptic ulcer and the best results are attained, if the two (life-style and bacterium) are combined (Levenstein 1998). Nevertheless, *Helicobacter* is present in most cases of peptic ulcer (Suerbaum/Michetti 2002) and the typical linear strategy of medicine is the eradication of the bacterium understood as 'causing' the disease.

Such an intervention into an ecological context changes its balance. Therefore, some scientists expected an altered immune response with unpredictable consequences after *Helicobacter* eradication (Whitfield 2003). There is, indeed, some evidence that the

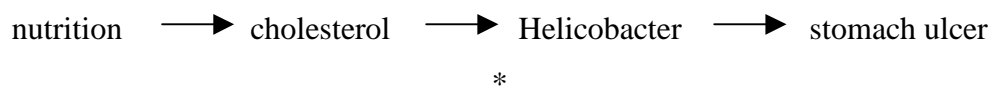
eradication of *Helicobacter* contributes to cancers of the upper stomach (cardia) (Kmangar et al 2006), to asthma (Chen/Blaser 2007), to oesophageal disease and infant diarrhoea (Whitfield 2003).

Applying a linear logic to such relations is somehow confusing. When *Helicobacter* is defined as the ‘cause’ of stomach ulcer, then the eradication of *Helicobacter* is the ‘cause’ of oesophagitis, diarrhoea, cardia cancer and asthma. But such statements do not really make sense as systems like the gut are necessarily nonlinear. For example, in mice the prognosis in the case of a re-infection with *Helicobacter* is worse than in the infected and untreated animals (Mueller et al 2005). This finding makes only sense, when principles of adaptation are introduced.

In any case, it would be more appropriate to talk about the ‘presence’ of *Helicobacter* facilitating gastric ulcer and not of ‘causes’ or of *H. pylori* ‘infection’. This becomes even more obvious when different contexts are taken into account.

The stomach is normally protected against bacterial damage through gastric mucin (Kawakubo et al 2004). The reduced defence mechanism could be seen as cause of the disease on a different level. This is, indeed, the old paradigm of stress theory. But also nutrition plays a role. It not only influences the gut population, in general. Exogenous cholesterol enhances the growth of *H. pylori* populations directly (Kawakubo et al 2004). That is, a nutrition rich in cholesterol (the minor part) or inducing the own production of cholesterol (the major part) contributes to the increase of *Helicobacter*.

A ‘causal chain’ (chap 2.1.d) – wisely knowing that such a chain has no other meaning than to exhibit the theory and interest of the observer – would be



Every intervention, every drug changes the gut flora contributing to many diseases (Stockert 2001). The effects of iron, antibiotics and systemic cortisone can be judged in middle and long term only, when their effects on the gut are considered. For example, the higher incidence of breast cancer through antibiotics has been attributed to the damage they do to the gut flora (Velicer et al 2003).

Another disease attributed to the damage of the gut flora through antibiotics and bad diet is eosinophilic oesophagitis which showed a sharp rise in the last years (Noel et al 2004). Its eosinophilic character is of special interest. Eosinophilic reaction is normally seen in helminth infection or in allergic disease. The two are somehow

interconnected as the reduction of helminth infections leads to a rise of allergic disease (Wickelgren 2004). One proposed explanation for this finding is that worm infections occupy certain receptors which might provoke allergic disease when not used. This theory, as such, is surely too simplistic as receptors change according to a certain situation and IgE is part of a wider network (Gould/Sutton 2008). However, it provides a first rough model of how the body can be triggered by different germs, or, if these are lacking, by other substances.

The theory says, more generally spoken and probably much nearer to the truth, that the immune system has to be occupied with a certain amount of germs, otherwise it occupies itself with substances normally not acting as an antigen. This is also the core of the so-called *hygiene hypothesis* (Watts 2004). It says that the reduced contact with bugs leads to allergic disease. The theory is based on the observation that a reduced exposition to bacterial and helminth diseases is related to atopic disease. For example, children with many brothers and sister and/or with animals, and/or children living on farms have an impressingly lower incidence of allergic disease (Braun-Fahrlander et al 2002).

The hypothesis is supported by animal studies (King et al 2004). "Autoimmune diseases in susceptible strains of mice or rats develop earlier and at a higher rate among animals bred in a specific pathogen-free environment than among animals bred in a conventional environment." (Bach 2002). Even lymphoma (Becker et al 2004) and multiple sclerosis (Ponsonby et al 2005) are connected to the lack of exposition to bugs. Some attribute the protective effect of bacterial infection to T cell differentiation and to the level of cytokines (Weiss 2002).

The 'hygiene' problem starts already with birth. The gut flora develops within the first 2-3 days. The first colonisation is extremely important. Colosturm, the first milk in breast feeding, plays a major role. But the bacteria of the environment as well. It has been shown that infants born in a modern hospital are exposed to fewer bacteria and develop a less rich flora than children under 'normal' hygienic conditions (Stockert 2001). As in hospitals patients acquire multiple antibiotic-resistant enterococcal strains within days of admission (Gilmore/Ferretti 2003) hospital birth might contribute to allergic disease in two ways. It leads to a reduced flora and it provides highly selected, often pathogen bacteria.

Therefore, the hygiene hypothesis has to be seen in a wider sense. It is not only the confrontation of the immune system with certain bacteria that matters. It is also the

question which bacteria persist in the human under which circumstances. This wider concept explains why infectious diseases during the first 6 months of life are associated with an increased risk of atopic dermatitis (Benn et al 2004). The more inadequate the gut flora is, the more probable are infections and the more probable is the persistence of pathogenic germs.

Antibiotics play a role. "By altering the balance of gut microbes, antibiotics can disrupt the immune system's ability to distinguish between innocuous substances and harmful microbes. This finding, from experiments on mice, adds weight to the notion that antibiotics could be at least partly responsible for the rise in allergies and asthma in children" (Randerson 2004). This connection between the use of antibiotics and allergic disease has been maintained by many researchers (Bach 2002; Randerson 2004, Noverr et al 2005). But it is no surprise that other studies do not confirm these findings (Benn et al 2004).

As the gut is a nonlinear system, interventions into its ecology through nutrition or in eradicating certain bacteria will not reveal predictable results. Nothing might happen, consequences might occur only very slow, or other co-factors are needed to produce symptoms.

Therefore it is also doubtful whether the administer of worms in patients with bowel inflammation or allergic disease is really as useful as first results suggest (Coghlan 1999, Kolfs 2004, Summers 2005). Although the eradication of the helminths gives rise to allergic reactions, this does not mean that the administration of helminths will have the opposite effect. This linear exchange value is not true in polyvalent situations (chap 3.5). This does not mean that the application of worms is generally useless. It only means that the whole concept has to be considered cautiously, especially all generalizing statements.

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The administration of living organisms, so-called *probiotics*, has a long tradition, but was seen as "folk medicine" (Tamboli et al 2003) used only by different methods of complementary and alternative medicine (CAM) in the treatment of atopic diseases, in all kind of bowel disturbances and in people with a tendency for infections. Only lately its positive effects became accepted by orthodox medicine (Bach 2002; Shanahan 2003) and had been proved to be effective in respected trials (Tubelius et al 2005). Thus the positive effect of germ administration became more widely accepted.

*B. thetaiotaomicron* is helpful to prevent bowel inflammation (Gilmore/Ferretti 2003) and *E coli nissle 1917* is as effective in the treatment of colitis ulcerosa as mesalazine (Rembacken et al 1999). The protective effect of the *E. coli nissle 1917* was detected (by observation) in WW I, when the bacterium was isolated in a soldier who was spared of a severe gastroenteritis. The bacterium became the main substance of a probiotic remedy (Mutaflor<sup>®</sup>), and was used since for many purposes.

In the now flowering research on probiotics it has been found that already the DNA of probiotic bacteria has an immunostimulatory effect (Rachmilewitz et al 2004). But even this has been known by CAM for decades. Refined parts of bacteria (for example Prosymbioflor<sup>®</sup>) is used at the beginning of a probiotic therapy, in small children and/or in sensible persons.

The orthodox proposition to add the immunostimulating DNA to nutrition in order to avoid allergic diseases (Rachmilewitz et al 2004) springs from the linear thinking that so often leads into trouble. The therapy with refined bacterial parts has sometimes no effect, but not so rarely it leads to an overstimulation with all kind of inflammatory reactions. Therefore it is no surprise that a trial showed that the general administration of certain probiotics is correlated with an increased mortality in acute pancreatitis (Besselink et al 2008). Probiotics have to be dosed carefully and the regimen has to be altered according to the observed effects. There is no simple dose – effect relation. But the gut flora is only one part of human symbiosis, although the most prominent one. The flora of the mouth, the ears, the vagina, the skin, they all play a role in the adaptation of humans to their environment and in the competence of the immune system. Actually, the human organism consists of 90% non-human cells (Nicholson et al 2004).

Thus, all kinds of diseases might be influenced with probiotics. It is a quite common strategy in vaginosis. Also HIV-infections seem to be to some extent preventable through lactobacillus (Tao 2005). As this germ is often present, especially in the milk and the mouth, this might explain why the transmission of HIV through breastfeeding is rarely observed. It was also proposed to use probiotics in recurrent otitis media (All-Stodley et al 2006).

The understanding of the bacterial biotope ‘human’ is essential for any concept of chronic diseases.

For example, it is futile to ask which germ is causing bacterial vaginosis. Until now 35 bacteria have been found (Fredericks et al 2005) and may be *Helicobacter* will



have soon some companions as the cause of peptic ulcer. However, these germs might often be more an indicator of an imbalance and less a causal agent.

### **c) the viral flora**

The real challenge in regard to methodology and epistemology lies in the '*viral flora*'. The difference to the bacterial flora is that the viral flora crosses individual boundaries. It oversteps the boarder from me to other and the border from one generation to the next. Viruses are more involved in human recursive processes than bacteria and by that they have more long term effects. They might become part of the human genome with positive and negative effects (Zimmer 2008).

Knowledge on the viral flora is quite new and there is no adequate concept until now. The current findings give only an outline on how adaptation and learning involve virus' functions.

In the first place it is important to know that viruses might persist, despite sufficient T cell immunity. This is known for the human erythrovirus (Norja et al 2006), for the syncytial virus (RSV) (Schwarze et al 2004) and the metapneumovirus (HMPV), discovered 2001 (van den Hoogen et al 2004). The last two often provoke bronchiolitis in small children and their persistence has been associated with asthmatic disease, as is the case with a growing numbers of viruses (Infectious Diseases Society of America 2007). In order to improve the health of the patients strategies to eliminate the viruses have been discussed. But this approach might be a fallacy. Either the persistence of these viruses is an expression of an inadequate immune response, or it is the (evolutionary) aim that they persist. In the first case, the immune response should be improved. In the second case, the persistence of the virus might have benefits for the host. Under both circumstances nothing is won by the eradication of the virus.

The persistence of an infectious agent – able to change the whole adaptation (Grenfell et al 2004) – might be helpful as it leads to a steady immune response that exerts an immune pressure onto other viruses persisting in the human, called 'cross-protective immunity' (Holmes 2007), which might be another explanation for the hygiene – hypothesis.

The simultaneous infection with the GB virus, a close relative of the hepatitis C virus, leads to a survival benefit in AIDS (Pomerantz/Nunnari 2004; Williams et al 2004a; Xiang et al 2004). Also measles have a protective effect in AIDS (Moss et al 2002).

On the opposite the cytomegalovirus is associated with a poor prognosis (Deayton et al 2004).

It is known that the infection with measles also has a protective effect for asthma (Benn et al 2004). Asthma is also improved through the infection with hepatitis A in certain genetically susceptible persons (McIntire et al 2004). The AAV2, a harmless virus present in many humans, is known to kill cancer cells and humans carriers tend not to develop cervical cancer associated to the human papilloma virus (HPV) (Meyers2005). Also the latency of the Herpes virus is associated with a better protection against bacterial infections (Barton et al 2007).

That is, viruses harmful under certain conditions are helpful under other conditions. This is very much the same with what is seen with *Helicobacter* and its relation to gastritis, oesophagitis and cardia cancer.

What happens now if such an ecological flora is altered through vaccination? Will it do more harm than good (Ruby et al 2004)? It is very difficult to raise this issue, as no other subject is so emotionally and irrationally discussed as vaccination. Nevertheless, it is crucial to understand the issue in the context of complexity.

Varicella is a harmless disease in early years. The mortality is about 0,41 per million inhabitants. In later years the complications of the disease rise, and, when the virus persists, this might lead to herpes zoster. Through vaccination mortality could be reduced to 0,14 per million (Nguyen et al 2005). Also the occurrence of Herpes zoster in the adult declined (Oxman et al 2005). Therefore varicella is included into the normal vaccination program in many countries. But in general the health problem caused by the varicella virus is quite small as its mortality is extremely low.

Concerning herpes zoster it could be demonstrated – in line with the hygiene hypothesis – that elder people having regularly contact with young children have quite a smaller probability to develop the disease (Thomas et al 2002).

What will happen when varicella is eliminated from the viral spectrum? Will health improve or not? We have no idea what role varicella plays in our viral flora (the adaptation hypothesis) and we have no idea what people who suffer now on herpes zoster will suffer when the varicella virus is no longer present (the inadequate immune response-theory).

If the aim is to avoid complications or infections in grown ups the exposition to the virus could be promoted, as well. This is nothing else than the probiotic concept in the field of viruses. In my youth this was propagated by mothers. Whenever a child had

measles or varicella, all children of the neighbourhood were collected to play with the infected child. Proposing a measles party today provokes rather fierce reactions. Measles became a feared disease. It is difficult to say whether the complications found in spontaneous outbreaks of measles really justify these fears. In any case the reaction of the medical world, the media and the readers of newspapers is enormous (Arenz et al 2003, Papania/Strebel 2005, Steinhauer 2008 and readers comments). In order to judge the complications of a viral disease it is not sufficient to take only the immediate impact of the disease into account. Also short and long term consequences for health in general have to be observed. Furthermore, there is also a social aspect which might be important in long term considerations.

When the Incas first came in contact with the European varicella virus and with measles this had a disastrous effect for their population. The same was true for the Red Indians. The events in North and South American can be compared with the Spanish flu 1918/1919. Confronted with a totally new virus, an avian type of influenza, millions died. This first contact lead to an overreaction of the immune system which provoked most deaths (Kobasa et al 2004, Kash et al 2006). The same seems to be true for the Avian flu virus H5N1 (Jong et al 2006). May be an overreaction is the typical pattern when a population is exposed to a new germ for the first time.

These disastrous reaction cannot be attributed only to the lack of antibodies. If a community has lived with a germ for a longer time, also the individual which never had contact with it before and has no specific antibodies is, in a way, protected and the reaction is smoother. This has been observed with measles in America or with syphilis (as an example of a bacterial disease) in Europe.

Three mechanisms might play a role. First, an epigenetic transmission might provide some specific information about the germ (chap. 4.3). Second, a population might develop a cross-immunity through an ecological context (gut flora, persisting viruses). Third, the virus might change after several transmissions from human to human. There are indications for all three possibilities and these possibilities might even work hand in hand.

The question remains, whether it is useful to vaccinate against of large variety of viruses with an unknown long term effect, as there are no ideas about how this changes the human adaptation in general and to other viruses in special. Will other viruses become more potent? And what happens in times of war or famine when

vaccination programs are no longer available? There was never a long period of time in human history with such stable conditions that exhaustive vaccination programs would have been possible. The reoccurrence of a disease in a situation when the community has ‘forgotten’ how to react adequately, might lead to such a disastrous effect as varicella and measles had in 15<sup>th</sup> and 16<sup>th</sup> century in America. Such effects are already feared in some African countries where polio has been eradicated through vaccination campaigns of the WHO. The reoccurrence of the virus finds now a susceptible population who never had a contact with the virus (it has been formerly eradicated) nor is it sufficiently vaccinated due to social factors (MacKenzie 2006). Another question is, whether it is useful to vaccinate against a variety of viruses that on one side produce some harm, on the other side protect against some chronic disease? Already there are some propositions to vaccinations with living germs in order to stimulate the human immune system as the lack of infections facilitates the emergence of allergic disease (Asuitran et al 2004). In its final consequence such an idea aims to reinvent the viral flora.

The nonlinear nature of the immune reaction to virus infections shall be highlighted with the following experiment: The Coxsackie virus is structurally similar to the polio virus although it provokes a totally different disease. Coxsackie is responsible mainly for catarrh like symptoms and rarely has severe complications. The discrepancy between the morphological similarity and the different clinical picture was explained by different receptors at which they dock. But when mice were genetically altered such that there were no more ‘polio receptors’ anymore, the animals developed the typical picture of polio when the Coxsackie virus was injected (Dufresne/Gromeier 2004). This finding reminds the receptor theory explaining the relation between helminths and atopic disease.

The fear is now that if the polio virus is totally eradicated and no more vaccination is performed, then may be the Coxsackie viruses will lead to a polio like diseases. Although such a conclusion is too speculative, it shall hint to problems that might arise when the viral flora is changed actively in a process which has been called ‘conscious purpose’ (chap. 6.1).

In reflecting and discussing such problems there is no lack of data, but a lack of epistemological tools. This shall be demonstrated with the following example. A survey found that the vaccination of children in Guinea Bissau lead to an increased overall mortality (Kirstenssen 2000), whereas another study showed that the

vaccination with DPT and BCG in Burkina Faso lead to a decrease in overall mortality (Vaugelade et al 2004). The discussion of these results remained mainly on the level of the validity of the data (Hall 2004). By that the question of long term effects for the health of people in general and for the overall mortality in special could be avoided.

Without a sound epistemology it is impossible to tackle such questions as the specific-unspecific issue spoils everything. One contribution to the discussion even spoke of “non-specific "non-effects" of vaccination” (Fine 2004). However, the long term effects of a vaccination for the health in general have to be considered carefully in order to come to sound results (Shann 2004). That they are currently called unspecific is only due to the used theory. A more adequate theory makes it perfectly easy to model the underlying processes and to judge short and long term effects. We have proposed the concept of learning (Ivanovas et al 2007) which will be discussed later (chap. 4.3).

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A further aspect, normally forgotten in the usual discourse was raised by Bleuler. Two years after the Spanish flu he called the handling of the epidemic as embarrassing for medical science. In his opinion the occasion was missed to understand what kind of natural treatment (in modern terms: non – specific treatments) are best to prevent such disastrous complications in the case of a future epidemic (Bleuler: 54-56). His main concern was to promote a suitable robustness in order to withstand negative impacts of a flu or another infection.

This is a typical change of the context, a clash between first and second order strategies (chap.6.8; 6.9). First order strategies are mostly promoted today: antiviral drugs and vaccination (Pearson 2004d, White et al. 2009). But in a new pandemic with an avian virus neither the vaccination will be possible in a reasonable time (MacKenzie 2005), nor the drugs will be sufficiently available (Abbott 2005), and/or both might not work.

The currently spreading flu (H1N1) is a good example (summer 2009).

Neuraminidase inhibitors might help a little or not (Kawai et al 2009) and a vaccination is not available. When available, it might be too late for a major effect on the spreading of the disease. That is, the treatment of the flu is ‘symptomatic’.

This means

- a) bacterial superinfections are treated with antibiotics,
- b) anti-pyretics are given to relieve the symptoms.

Whereas the first strategy is meaningful, there is a lack of scientific evidence in the case of anti-pyretics. Moreover, there is some evidence that anti-pyretic therapy does more harm than good (chap. 6.8). If we add further that hospital treatment is rather problematic because of nosocomial infections and/or medical errors (chap. 3.6) and that a research showed that 6 of every 100 patients dying in a hospital die due to adverse drug reaction, mainly due to anti-inflammatory drugs and anti-pyretics (Universida de Granada 2008), Bleuler's valuation of the flu is as apt as a hundred years ago.

Non-specific treatments are still no issue in the medical discourse. Searching *pubmed* for the key words 'H1N1' and 'recommendations' (31.7.09) leads to articles about vaccination and drugs. The search for 'H1N1' and 'diet' leads only to one older article recommending energy restriction on the basis of animal testing (Ritz et al 2008). That is all. Some physicians might have a certain knowledge about a proper dietetic treatment in the case of a viral infection. But this is not the normal case. Of course, there are many ways to improve the immune-reaction in the case of an infection. Many of them might be far more effective than neuraminidase inhibitors. Water applications as proposed by Preßnitz or Kneipp (chap. 5.4.c) are empirically known to be very helpful. But such knowledge is neglected. Related research is scarce and only published in third degree papers – a result of the publication bias (chap. 2.1). Under the aspect of robustness or resilience the handling of the current viral pandemic is not optimal, for sure, as too few factors (vaccination and antiviral drugs) are taken into account. The argumentation is comparable in many other diseases. However, it is more prominent in viral diseases as the possibilities of a specific treatment are rather limited.

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Viral infections play a central role and are the greatest force in driving evolution (Weatherall 2003; Bradbury 2004). This does not necessarily require many generations. Genetic change is rather quick (University of Utah 2007) and not random (Pennisi 1998). For example, genes and viruses are able to exchange material recursively (Ruby et al 2004). Old viruses might become part of the genome and participate in the immune defence. This happened to the so-called endogenous

retrovirus (RNA based). These viruses normally behave indifferent, sometimes helpful (Dunlap et al 2006), sometimes harmful (Furlow 2000).

That is, certain persons will benefit from a viral infection, others will be harmed, and even this might change according to environmental conditions. The viral flora is therefore deeply interwoven into all processes of the human physiology and reproduction. The understanding of the viral flora will probably help to understand better the development of chronic diseases.

Naturally, the viral flora interacts with the bacterial flora and probably with helminths. But also prions play a role in the adaptation and the development of the immune system (Bradbury 2004; Pearson 2004). Until now we have not the slightest idea how all these mechanisms interfere. Furthermore, the whole is embedded in epigenetics (chap. 4.3), influences epigenetics and even might be the driving force for epigenetics (Goldenfeld/Woese 2007).

Such changes might persist across a number of generations. All this needs more complex epistemological tools than the concept of a specific therapy of a specific disease.

### 3. Epistemological Fundamentals

There can be no doubt that the whole success of exact Western Science was due to the fact that, since the time of the Greeks, a most rigorous process of eliminating and discarding highly legitimate problems was going on. Only such problems were selected for investigation for which suitable means could be found to treat them in a controllable and rational manner – derived from the principles of classic logic.

*Gotthard Günther* (1979: 247)

#### 3.1 Formal Logic – Syntax and Semantics

*In experimental science, however,  
a scientific man is the prisoner of his ideas,  
if he does not learn to question nature for himself,  
and if he does not possess suitable and necessary tools*

*Claude Bernard* (148)

Our logic is normally characterized as Greek. But this is only partly true. Sophists like Zenon, who may have become the most often cited philosopher in the current scientific literature, had little impact until recently. So, more precisely: our current logic is Aristotelian (Günther, 1978). Without even realizing our whole way of thinking is influenced by his kind of logic, (Günther, 1976: 250) and “even the most stupid farmer in Flandern would think and feel differently if Plato had not existed” (Maeterlinck cited in Günther, 1976: 353). We all have a precise feeling of what logic is. However, this feeling might be deceiving.

The argument “All men are mortal; all Greeks are men; therefore, all Greeks are mortal” (Mates: 4) seems logical to us, and so it is. Also, the argument “Men are mortal; Socrates is a man; therefore Socrates is mortal” might do at first glance, although it has the same logical value as “Men are numerous, Socrates is a man; therefore Socrates is numerous” (Russell: 164). There is something fishy about these arguments. To understand their hidden problem, let alone to solve them, requires certain logical tools. These tools are not only necessary to solve some ancient riddles. They are also crucial to describe and model living processes.

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Logic might be called the '*science of correct reasoning*' (Webster's). It comprises two different disciplines: syntax and semantics

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**Syntax**, is the *theory of uninterpreted signs* providing a structure which connects premises with conclusions. It "investigates the relation of *consequence* that holds between the premises and the conclusion of a sound argument. An argument is said to be *sound* (correct, valid) if its conclusion *follows from* or is a *consequence of* its premises; otherwise it is *unsound*" (Mates: 4). Syntax is not about truth. It is about proof.. It "guarantees only that if the premises are true, then the conclusion is also true. It does not guarantee that any of the premises are in fact true, nor does it give us any information about the truth-value of the conclusion in case one or more of the premises is false" (Mates: 7).

That is, in order to judge the soundness of a statement, the truth-value of its premises and the soundness of the used deductive logic has to be assessed.

Sound proofs are, however, often problematic: "Mathematics is a deductive science: starting from certain premises, it arrives by a strict process of deduction, at the various theorems, which constitute it. It is true that, in the past, mathematical deductions were often greatly lacking in rigour; it is true also that perfect rigour is a scarcely attainable ideal. Nevertheless, in so far as rigour is lacking in a mathematical proof, the proof is defective; it is no defence to urge that common sense shows the result to be correct, for if we were to rely upon that, it would be better to dispense with argument altogether, rather than bring fallacy to the rescue of common sense. No appeal to common sense, or 'intuition', or anything except strict deductive logic, ought to be needed in mathematics after the premises have been laid down" (Russell: 144-145).

This rather strict statement by Russell demonstrates an essential difficulty when it comes to medicine. Russell is absolutely correct refuting intuition as a substitute for logical rigour. The problem is, however, that mathematical rigour is an impossible aim in the science of the living. The main attempt to achieve such rigour is reductionism. But the reductionist approach improves vigour at the cost of the truth-value of its premises, as the conditions of the experiment does not represent anymore the natural conditions (details in chap. 3.5).

Furthermore, there is a hidden joke in Russell's statement. Russell's attempt was to solve certain problems of logic and to provide more rigour. However, as will be shown below, he induced a development in logic which finally lead to the discovery

that rigour is essentially unobtainable, that there is an abyss of incertitude necessarily inherent in all reasoning.

\*

**Semantics** is the *theory of interpreted relations and structures* (Günther, 1979: 7). Interpretation is the implementation of meaning. Nothing has a meaning as such, just as seen with the measurements in medicine (chap. 2.1.b). It is attributed by an external observer. But things are not without meaning either. Without meaning things would fall apart. Especially in medicine. All communication (chap. 4.2), all therapy (chap. 6.13) is the creation of meaning, of values (chap. 6.1). But meaning is not an item as such, not a simple measurable entity. It reveals itself in a structure, in a relational frame.

Strangely enough, semantics play only a subordinated role in our current science, despite its overriding importance. Except for Peirce in the 19<sup>th</sup> century (chap. 3.9), only a few biologists and human scientists of the 20<sup>th</sup> century (Bateson 1972; Watzlawick et al. 1967) applied a semantic logic.

It is this neglect of semantics which leads to the autistic-undisciplined thinking in medicine (chap. 2.1.c). Medicine is undisciplined because there is no structure to formalize complex phenomena. It is autistic (according to current definitions of autism) because the reductionist approach excludes the relational aspects. It might be a coincidence that many important scientists suffered from Asperger syndrome, a kind of autism (Fitzgerald 2004), whereas artists are more inclined to develop psychotic states (Jamison 1993) with an excess of relational thinking. May be the difference between the scientific and the artistic thinking (chap. 1) is somehow also a reflection of the difference between syntax and semantics.

### **3.2 Russell, the Paradox and the Therapy of Diseases**

Modern epistemology started June 16, 1902. This day Bertrand Russell wrote a letter to Gottlob Frege pointing out that Frege had not solved the ‘liar’s paradox’. The ‘liar’s paradox’ dates back to the Cretan Epimenides saying: “All Cretans are liars” or in a more strict form: “I am lying”. Logicians of all times had been preoccupied with this paradox which is true when it is false and false when it is true.

This paradox is not only a philosophical and mathematical riddle.

In pushing the button of an electric bell the electricity begins to circulate in order to interrupt the circulation, so that electricity can flow again. Clock-genes (chap. 4.7) use exactly the same mechanism. They produce a protein inhibiting the production of this substance. Such negative feedback mechanisms are characteristic for most, if not all processes of the living. That is, the liar's paradox is a central principle in biology. Russell did not really solve the paradox. But he made some first steps for a better understanding of the structure of the argument.

Russell starts from so-called 'propositions'.

„We mean by ‚proposition‘ primarily a form of words which express what is either true or false.....‘Socrates is a man‘ and ‚Socrates is not a man‘. ....A ‚propositional function‘, in fact, is an expression containing one or more undetermined constituents, such that, when values are assigned to these constituents, the expression becomes a proposition. In other words, it is a function whose values are propositions....‘x is human‘ is a propositional function; so long as x remains undetermined, it is neither true nor false; but when a value is assigned to x it becomes a true or false proposition.....A ‚propositional function,‘ in fact, is an expression containing one or more determined constituents, such that, when values are assigned to these constituents, the expression becomes a proposition” (Russell 1930: 155-156).

In other words, we start with premises that lead to an undetermined conclusion, the propositional function. Statements on the basis of this function are propositions which are either true or false.

In medicine, diseases are propositional functions. Diseases are defined in respect to anatomical, physiological and/or biochemical alterations which constitute our premises. That is, we regard it as meaningful to model diseases in this way (chap. 3.4). The next step is that someone might suffer from the disease defined in the premise (e. g. diabetes), thus representing (logically) a proposition (a diabetic). “Terms satisfying ‘ $\phi x$  exists‘ means ‘ $\phi x$  is sometimes true” (Russell: 165).

Diseases are thus potentialities on a logical curve but do not exist as such.

In a first paper in which I combined Russell's ideas with clinical practice I questioned some epistemological basics of randomised clinical trials (Ivanovas 2001). This provoked strong reactions. One reader declared the problem to be diagnostic in nature, not logical. He claimed that although the aim might be to treat the disease, very often this is not practical as the disease is unknown. Thus, only symptomatic treatment is available (Pischon 2001).

Similar was the reaction to an article in the BMJ which doubted the diagnosis of anxiety and the strategy of its medical treatment (Shorter/Tyrer 2003). In a letter a

reader claimed that mental disorders are precisely diagnosable and that “drugs are used only to treat disease (cause) not symptoms (effect)” (Weeks 2003).

These are issues which only can be tackled with a sound logic as there seems to be some confusion about what is actually treated. Symptoms? Diseases? People? What are the definitions? Can a symptom be treated without treating a disease? Can a disease be treated without treating symptoms?

For understanding and solving formal paradoxes (and other confusing states) Russell and Whitehead developed the ‘**theory of classes**’ in their *Principia Mathematica* (1911-13).

A logical class is formed when a propositional function is sometimes true (Russell: 160). If there is someone suffering from diabetes the class of diabetics would exist. The core of Russell’s ideas was that statements true for the members of a class (diabetics) are logically different than statements about the class (diabetes).

“Statements about functions are functions about functions” (Russell: 186). A paradox arises when statements about a class are used for the members of the class and vice versa (Russell: 136). The theory of classes (or logical types) prohibits in doing so.

This kind of paradox shall be demonstrated with a simple example.

There is the enterprise Ford as the class and the car Ford as a member of the class. Statements about the class (enterprise) are not valid for the member of the class (car) and vice versa. The car can drive with high speed, the enterprise not; the enterprise can be in financial difficulties the car never; if a car is sold the enterprise is not sold and so on. Until here it is obvious. The difficulty (and the paradox) arises if we sell the enterprise. One could argue that selling the enterprise all unsold cars are sold, as well, but stay unsold. Such paradox statements are neither true nor false, they are, according to Russell, just meaningless.

The relation between the diagnosis and the symptom follow the same principles:

1. *A statement about symptoms is no statement about the disease:* we might have an unclear situation, in which we cannot be sure whether the symptoms belong to one disease or another.
2. *A statement about a disease is no statement about the symptoms:* In appendicitis we might see pain in the lower right quadrant (McBurney), local or general resistance, local or crossed rebound and so on. But nothing of that might be present in this form and nothing proves appendicitis alone.

Of course there has been much criticism for Russell's theory of types because it simply prohibited a logical operation. One of the first to contradict Russell was Wittgenstein, when he referred to recursive functions (chap. 4.2) in his argument 5.51 of his *Tractatus logico-philosophicus*. He maintained that a function cannot be its own argument, whereas an operation can take one of its own results as its base (Wittgenstein 1922). Gödel developed his incompleteness theorem (chap. 3.3) by using the statements of the *Principia Mathematica* recursively and showed that a complete proof is not attainable (Guerrino: 79). Spencer-Brown (who later developed his own recursive formalism) dismissed the basic approach of the *Principia Mathematica* altogether (Spencer-Brown, 1997: 126).

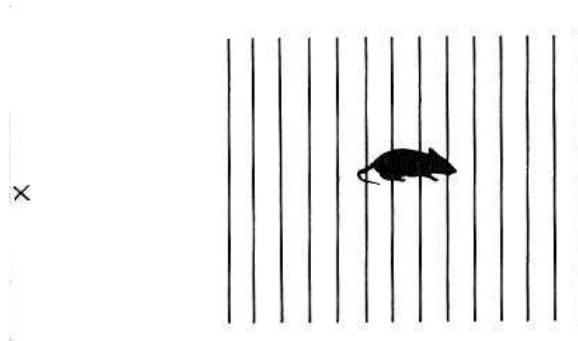
However, Günther, whose polyvalent logic is quite close to Russell's ideas, says that all the critics of Russell missed the main semantic question (Günther, 1979: 53) as they are only concerned with syntax. In fact, Russell's theories were the starting point for a lot of research on semantics (Korzybski, Watzlawick, Bateson).

Russell's theory of types is rarely used today. Mathematicians and logicians tend to claim that the problem he posed is solved. At most, the theory of types might be helpful to investigate the soundness of arguments, to detect circular reasoning and to avoid that a premise becomes its own proof (Guerrino: 79). But actually Russell's ideas are still crucial for the understanding of living processes as will be demonstrated later (chap. 6.4). Also the science of *emergence* (chap. 4.10) deals exactly with the questions Russell posed: How is the relation of parts (for example the genes) and the class (the phenotype or behaviour). How can there be an upward causation (from the elements to the class) or a downward causation (from the class to its elements)? Or are things totally different?

In order to investigate such issues, one has to be aware with which level of abstraction one is dealing. With elements/parts? With classes? With classes of classes? If these categories are not absolutely clear, all reasoning becomes meaningless.

### 3.3 Gödel, the Blind Spot and the Illusion of Completeness

A well-known experiment in perception research is the detection of the blind spot. If you close your left eye and look at the cross from a distance of about 20-30 cm the mouse will vanish, just leaving a perception of lines. Nothing is missing.



In this experiment the mouse is located in the blind spot and vanishes from our perception. However, there is no hole in our perceptive field. Nothing is missing. Everything seems to be self-contained, complete and true. Heinz von Foerster called this phenomenon: “we don’t see that we don’t see” (Foerster/ Bröcker: 34). It takes a different point of perception, a different angle to look from to reveal the mouse. This tendency to create an integral picture has been proved experimentally by gestalt psychology and in the social context by gestalt psychotherapy. That means, we always have a complete sensory perception although parts are lacking. This phenomenon is particularly prominent in persons with an enlarged blind spot through stroke or tumours. For example, such a patient saw only half of the food on her plate and could, consequently, only eat this half, complaining that she was served too little. When the plate was turned she saw the food again and again she could eat half of it (Sacks 1998: 77-79)

The same is true for every scientific approach. This blind spot has been formally proven by Gödel with his *incompleteness theorem* (1931), which “sent shock waves through the mathematical community” (Devlin 2002). This theorem says that in a given logical or mathematical system, the truth of an argument cannot be proved without doubt. A system is either without contradictions or it is complete (Guerrero: 51-52). The reason is that as soon as recursive or second order strategies are involved

(chap. 4.3) a gap of uncertainty opens. This implies also that if something is true and provable out of itself, it is contradictory.<sup>7</sup>

Although Gödel's theorem was initially about the system of arithmetic numbers, it was soon understood that it is applicable to all formal systems (Krippendorf 1986), showing that there is a structural incertitude in all reasoning.

Von Foerster, one of the main proponents of systemic thinking in the last century, summarized this situation as follows: "These limits of decidability, the limits of knowing, these connections between Wittgenstein, Russell and systems theory, or the theory of finite-state machines, were very gripping for me; the possibility to see a finiteness, a fundamental unanalyzability, an unknowability in these many things, of which one formerly believed that if only one were patient one would be able to solve them; if only one invented a few more tricks, one would be able to solve them. What is fascinating is the unreachability of an answer to a large class of problems" (von Foerster/Bröcker: 178, transl: Anger-Diaz for the unpublished English version).

Of course, the uncertainty principle is also true for medicine. That is, in a certain approach the truth of a certain argument cannot be proved without doubt and there are always blind spots. However, very often there is an illusion of completeness. Some factors which contribute to this illusion are:

1. mistakes in logical types
2. metaphysical shifts,
3. ignoring certain areas,
4. the use of explanatory principles.

**Logical mistakes** arise when, for example, signs, symptoms, diagnosis, and therapy are mixed up, as for example in osteoporosis (chap. 4.6). A lot is provable which is not necessarily true and many things are true but not necessarily provable.

A **metaphysical shift** occurs when things are described as they are perceived, and then one concludes that they have to be that way. It is a shift from description to prescription, already seen with reference values (chap. 2.6) and further described for neuroscience (chap. 4.6).

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<sup>7</sup> "the absence of contradictions in P is not provable in P on the condition that P really is without contradiction (if this is not the case every statement is provable, of course)" (cited in Guerrerio: 52, my translation).

The third strategy has also been called ‘**ignoring the incomprehensible**’ (Simon, 1995: 32, my translation). This is often used in complex situations, and the cases described by Oliver Sacks (chap. 2.2) illustrate how outstanding observations challenging normal medical logic are simply ignored. It is also a normal phenomenon of reductionist research. The concentration onto a few parameters allows stable results, excluding unpredictable behaviour. In such a setting nothing is missing and the resulting proves are true. However, they are incomplete.

In cases where unexplainable phenomena cannot be overseen or eliminated through an experimental setting the use of **explanatory principles** is quite common. The expression dates back to Bateson. He wrote so-called metalogues, dialogues expressing their meaning through form and content. Most famous became his metalogue *What is an instinct?* (Bateson, 1972: 38-58), a discussion between father and daughter concerning some central issues of scientific epistemology.

It starts:

Daughter: Daddy, what is an instinct?

Father: An instinct, my dear, is an explanatory principle.

D: But what does it explain?

F: Anything – almost anything at all. Anything you want to explain.

D: Don’t be silly. It doesn’t explain gravity.

F: No. But this is because nobody wants ‘instinct’ to explain gravity. If they did, it would explain it. We could simply say that the moon has an instinct whose strength varies inversely as the square of the distance...

D: But that’s nonsense, Daddy.

F: Yes surely. But it was you who mentioned instinct not I.

.....

F: Well, you know what ‘hypotheses’ are. Any statement linking together two descriptive statements is a hypothesis.

.....

D: Daddy, is an explanatory principle the same thing as a hypothesis?

F: Nearly, but not quite. You see, an hypothesis tries to explain some particular something but an explanatory principle – like ‘gravity’ or ‘instinct’ – really explains nothing. It’s a sort of conventional agreement between scientists to stop trying to explain things at a certain point.

The use of explanatory principles is very common. It includes the use of words which seem to explain a certain fact. But a more detailed analysis always reveals that such words actually obscure a lack of understanding. What Bateson showed in investigating the term *instinct* was, that trying to stay with a given meaning of such an explanatory principle, things become more and more confusing, as already shown with ‘mind’ (chap. 2.3) and ‘placebo’ (chap. 2.4).

It is not new that the use of such words is a major source of unscientific thinking.

Bernard, who cannot be suspected to be a muddler, stated 150 years ago “that we



must always cling to phenomena and see in words only expressions empty of meaning, if the phenomena they should represent are not definite, or if they are absent” (Bernard: 188), and “we must learn that the words we use express phenomena whose cause we do not know are nothing in themselves; and that the moment we grant them any value in criticism or discussion, we abandon experience and fall into scholasticism. In discussing or explaining phenomena, we must be very careful never to abandon observation or put a word in place of a fact” (Bernard: 187).

Applying this strict thinking to medicine, he concludes that “we should see that the words, fever, inflammation, and the names of diseases in general have no meaning at all in themselves” (Bernard: 188).

### **3.4 Heinz von Foerster’s Decidable and Undecidable Questions**

Sound reasoning is much easier than the autistic-undisciplined thinking suggests. The only precondition is that the relation between different logical levels is understood, about axiomatic suppositions and their logical deduction.

Heinz von Foerster presented a simple semantic form, which makes the structure of this logical process easy to understand. He deduced axiomatic problems by distinguishing so-called *decidable and undecidable questions* (Foerster/Bröcker: 1-12). A decidable question is the question is: “Can the number 6893284534286 be divided by 7?” With some calculation it is possible to answer this question. It is, in a way, already answered when it is posed. A decidable question has an inherent answer independent of whether we find this answer immediately, after some reflection or even if it is impossible to answer that question at the present moment . ‘How many degrees (in C<sup>o</sup>) are on the dark side of the Pluto?’ is as decidable as the question ‘How much money did you spend in the new fashion shop?’ The criterion for a decidable question is not that it is answered or that it is answered truly. The criterion is that there is a definite answer to the question.

Undecidable questions are of a totally different nature. The question ‘what is happiness?’ cannot be decidedly answered. According to certain criteria we only find a subjective answer. A Christian might say that it is to live to the satisfaction of god, something possible with some effort. A biologist will regard it as genetically determined (Reichhardt 2006). A neuroscientist may say that it is a “glowing (of) left prefrontal cortex and (a) becalmed amygdala” (Flanagan 2003), or a stimulation of

the award centre, or a complex neuro-biochemical process (Phillips 2003c). For a psychologist it might be a cultural problem connected to money (Diener cited in Bond 2001). Social scientists might see happiness as an issue of life style and geography (Bond 2003). A pessimist will hold it for an unattainable target, and for an addict it might be just a question of the next injection.

How an undecidable question is decided depends on many factors and no choice is compulsory. Therefore, von Foerster defined the decision itself as a **metaphysical act**, whereas the decision of a decidable question is just a logical operation.

When we look now at definitions of health and disease, we find a lot of decidable and undecidable questions. The question which germ causes tuberculosis, AIDS or SARS is as decidable as the question which substance has the strongest effect as bronchodilatator.

More difficult to comprehend is the fact that the diagnosis as such, the definition of a disease is an undecidable question. A pneumonia can be clearly defined as an inflammation of the lungs caused by certain bugs or other factors. Also tuberculosis, AIDS and SARS are somehow clearly defined. But there is no necessity to diagnose in this way. If the aim of the diagnosis would be to describe the state of the immune system allowing infections, then the name of a bug or the description of a local pathophysiological pattern would be of minor importance. On a logical level it makes no difference to establish a diagnosis according to emotional processes (as a psychoanalyst would do), according to supposed energetic patterns (acupuncturist) or the forces some spiritual healers take for granted. All these different strategies have their advantages and disadvantages. The choice depends rather on culture, practicability and available therapeutic tools. The choice as such is, however, a metaphysical choice. It happens according to the knowledge and the belief of a certain observer (chap. 3.8).

When we hear that a patient suffers on 'psychoanangastic disorder with schizoid traits', we learn little about the patient (he probably is a little strange), but we learn a lot about the one who makes the diagnosis, namely that he is obliged to a certain way of seeing and classifying mental disorders. But the very same is true with the diagnosis of epicondylitis (some pain at the elbow without any causal or functional reference), with pneumonia (certain clinical symptoms and/or alterations of the x-ray) or with rheumatoid arthritis (a certain typical swelling of the joints).

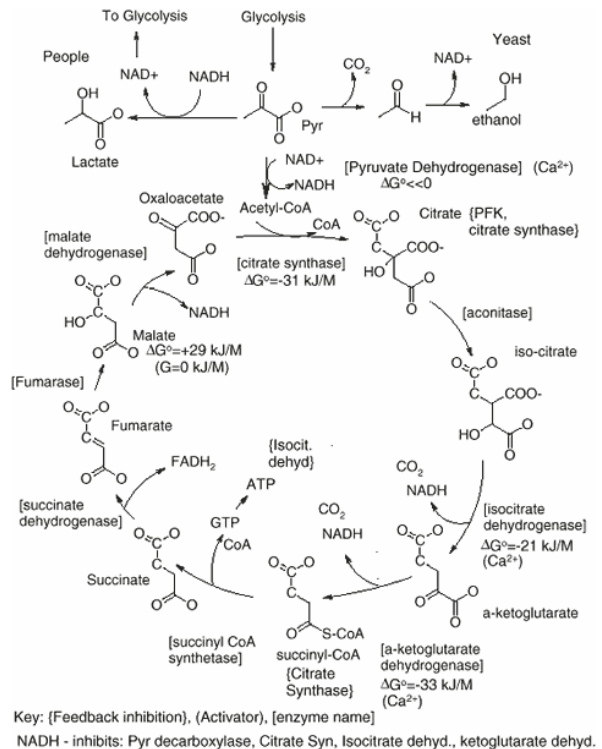
When an undecidable question is decided, the following questions become decidable. That is, every diagnosis consequentially implies a schedule of predetermined examinations and therapies. If ADHD is seen as a cerebral disease, the consequences are different as if it seen as an expression of environmental factors. When gastritis is regarded as a disease caused by a germ it will be treated differently as when it is seen as an expression of a certain emotional state..

The logical implications of such a decision are far reaching. This shall be demonstrated with a question from chaos-theory “How long is the coast of the British island?” It is a typical undecidable question. The answer is: It depends on the ruler. The finer the measuring ruler the longer is the coast, finally becoming infinite. It is a metaphysical act to decide on a ruler. The decision may depend on necessities, habits or anything else, but there is no must to decide it in one way or another. If only one ruler is allowed we call it nowadays a paradigm (3.10).

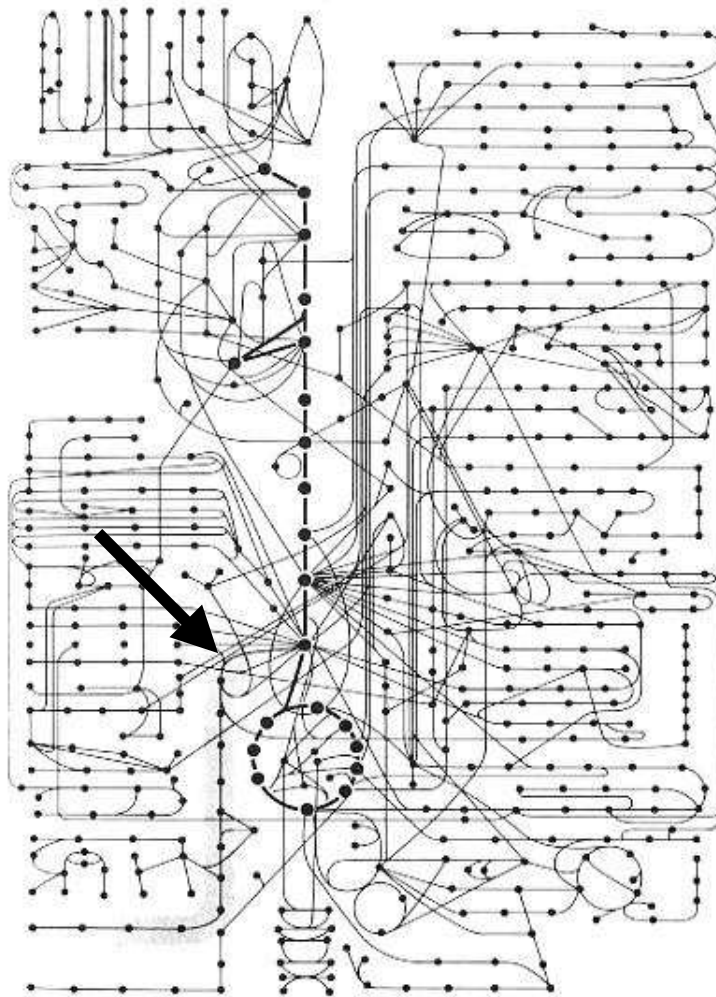
### 3.5 Gotthard Günther’s Polycontextural Logic

An ontological analysis of many-valued structures shows that only a tiny, almost infinitesimal, part of them coincides with the concept of Being or reality that we have inherited from the Greeks. If we intend to use the full range of logical possibilities now available to us but still cling to ancient ontological concepts, the result will indeed not be a canon but logical chaos. Gotthard Günther (1976: 251)

Reductionist medicine investigates a certain issue in a given frame. But medical practice consists of a multitude of frames. For example: “Choose one of the following. Asthma is a paediatric disease; an infectious disease; a developmental disease; an immunological disease; a genetic disease; or an environmental disease” (Lancet editorial 1997). Every theoretical approach leads to different concepts and definitions of a diseases (chap. 6.2). Therefore, statements and conclusions are often not comparable. What is true in one context may no longer be true in a different one.



A solution cannot be found in more facts. The opposite is true. The more facts the more complex a situation becomes – when no appropriate epistemology exists. The logical principle of contexts shall be demonstrated with the example of the citric acid cycle (Fig. citric acid cycle 1). However, this cycle does not exist. In the metabolism of the liver the citric cycle is but a small section within a multitude of connections (Gerok: 21), a thought line, a theoretical construct of an observer



connecting certain biochemical processes. The function of this network is influenced by a lot of factors like hormones, the function of the nervous system, or the nutrition. Also all kind of behaviour plays a role. For example, insulin and catecholamins are altered in a child observing the arguments of its parents (chap. 5.2). Thus, it can be expected that the whole and/or certain parts of the citric acid cycle

(the step from fumarate to succinate, for example) might be altered by this and other experiences.

As a consequence, every part of any biochemical or physiological circle might be depicted within in a different context involving other cybernetic cycles. Thus, “every world datum in the contextuality of Being should be considered an intersection of an unlimited number of contextures” (Günther, 1979: 289). In chaos theory such an intersection is called *local activity* (Chua 2005) influenced and expressing the whole.

That is, a model like the citric acid cycle is only the reality of an observer who organises his/her perception according to a certain theory or to certain interests. "The simplest human question "what does the system do?" (which translates into "what was the system selected for") usually has simultaneous multiple correct answers" (Brent/Bruck 2006).

How is it possible to handle such different contexts logically? Gotthard Günther was a forerunner in analysing such structures which he called **polycontextural**.

A mono-contextural design allows a two-valued logic, the Aristotelian Trinitarian axiom, the *tertium non datur* (chap. 2.1.d) (Günther, 1979: 291). In such a defined context something is true or not and a third is not allowed. This is the basis of all reductionist research, as well.

However, when the investigated parameter is an intersection of different contextures the situation changes dramatically: "If we consider such a point of intersection as belonging only to one contexture, the point can only be occupied (consecutively) by two values. If we consider it as belonging to two contextures, the point will still only be able to be occupied by two values but they may now belong to two different contextures" (Günther, 1979: 291).

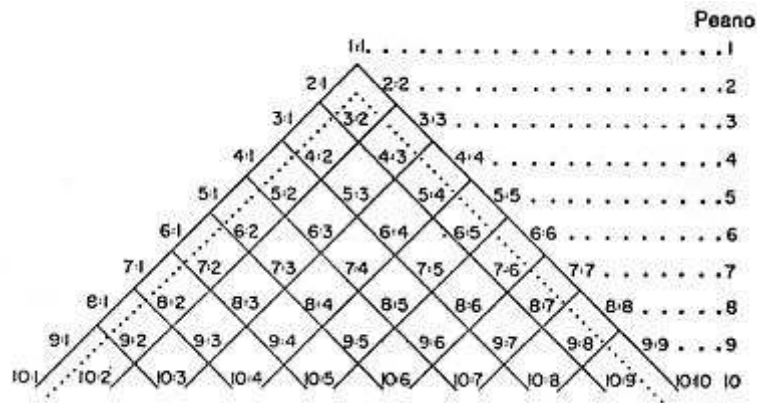
The difference between a mono- and a polycontextural logic can be demonstrated with the process of negation. In Aristotelian logic the negation has a linear exchange value with its opposite. A double negation leads to the initial value, something no longer true in a poly-contextural pattern (Günther, 1976: 141-188).

This can be translated into medicine with the following example: a stem cell becomes specialised. Adding the substance *reversin* to a muscle cell, it becomes deprogrammed. Afterwards it can be brought to produce other tissues, such as bone or tendons (Chen et al 2004). The change

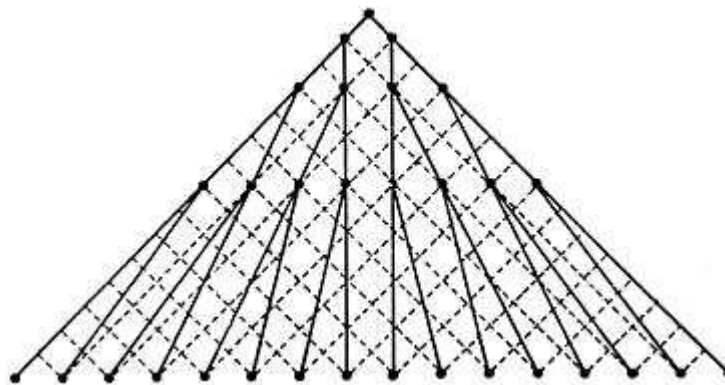
stem cell → muscle cell → stem cell → bone cell

is a process of programming and deprogramming (which is a kind of negation) where the result depends on the context. In a stable context the exchange value of the stem cell and the specialised cell is linear. Under changing conditions the result becomes non-trivial (chap. 4.5). This is found in all kind of plasticity and in gene expression. For example, genetically similar fish have different gene expressions according to their life-style and genetically different fish have a similar gene expression when they share the same way of living (Giger et al 2006).

To demonstrate characteristics of polycontextural networks, Günther used the example of the heterarchical numerical pyramid (Günther, 1979: 299-303). This is a rather simple model, as the connections are linear. No recursive loops (chap. 4.2) are involved. Cybernetic circles increase the complexity, but not necessarily the logical principles described below.



In this pyramid there are different choices to go from the top to the bottom. In ascending again one might reach the same starting point by using a different way.



In general systems theory (chap. 4.7) this fact is called *equifinality* and means that a given system has different possibilities to reach a goal. However, this is against the basic principle of Aristotelian logic saying ‘the way up is like the way down’ (οδός άνω κάτω μία) (Günther, 1979: 274).

This fact has important impacts for medical research. First, all traits and pathways investigated in reductionist research are only one option. Second, an analysis of such pathways might lead to certain ‘causes’, but it does not allow to conclude from these ‘causes’ onto the behaviour of the human. Although this is a platitude in medical practice, the logical basis has to be understood in order to avoid a flawed reasoning. For example, it is possible to analyse a certain behaviour down to the genes. But it is impossible to conclude from the genes onto the behaviour (detailed analysis in

appendix V). This is why the correlation between a certain trait and a gene is often as low as 8 % for most of today's 'genetically caused diseases' (Paísan–Ruiz et al 2004). Similar is the case of brain metabolism where the stimulation of certain biochemical pathways through drugs leads to different clinical pictures and similar clinical pictures can be attained by stimulating different biochemical pathways (chap. 4.8).

All this cannot be explained when a gene or a biochemical pathway (logically: an intersection of a polycontextural network) is investigated with the Aristotelian principle of the *tertium non datur*. A higher order of logic is necessary.

An early attempt of such a higher form of logic was the Indian *tetralemma*. It was a logical operation used about two thousand years ago in judiciary. It exceeded the restrictions of the two-valued logic of 'guilty – not guilty'. It says that a case has to be investigated according to the following possibilities: *the one, the other, both, neither*, which constitute the classical tetralemma. Although not actually taught that way, it is a normal logical operation of every physician. Indian logic exceeds this frame, however, and continues with: *not all of this - and even not that*. (Kibéd/Sparrer: 77-93).

This procedure is in line with the findings of Günther who found that higher forms of logic can only be attained when the two-valued choice is rejected as such. But how is it possible to reject a two-valued choice? In medicine a rejection would be to see a disease like *ulcus duodeni* not as a local problem triggered by physiological processes or by a germ, but as an expression of a personality, connected to emotions (psychosomatic concept). Some traditions of CAM (as acupuncture or homeopathy) even reject the psychosomatic concept.

Each of these rejections is an extension of the context. It implies an environment for the two-valued choice with the ability to modify the basic values. The two-valued logic as such has no environment (Günther, 1976: 315). A recurrent otitis in a child is normally caused by a bacterium or a virus. The Trinitarian choice would be to decide on the germ. A rejection of this choice would be to see the disease as a lack of resistance. Leukocytes, antibodies and the genome would be important on this logical level which is no longer concerned with the local process. It investigates the general physiological condition. A rejection of this would be to see the recurrent otitis and the lack of resistance as a result of social behaviour (nutrition, exercise, exposition to climatic factors, etc.). On this logical level higher forms of learning (chap. 4.3), like robustness (chap. 6.4) become important.

The classical reductionist medicine creates a situation without environment as all influencing factors are held stable. Thus, the polycontextural structure becomes invisible or is even dissolved. This is insofar useful as the results of such a research become *reliable and true*. “**As an ultimate foundation, truth implicates a two-valued state**” (Günther, 1976: 217, my translation). But although two-valued states are true, they are simultaneously **meaningless**.

In a polycontextural setting (taking other contexts into account) statements might still be logically correct but their value is no longer a truth-value (Günther, 1976: 219). “A change of values in a many-valued order may under given circumstances produce a change of meaning” (Günther, 1976: 317).

This fact is crucial for medical reasoning. It implies that only reductionist research is true. But to a certain extend – as seen before (chap. 2.1.b, 2.7) – it is meaningless. The *meaning arises in a given context, but then it is not true anymore*, at least according to the Aristotelian principles. That is, the attempt to attain true complex results is a logical contradiction, in line with Gödel’s incompleteness theorem (chap. 3.3). The use of probabilities to solve this problem is at most a restricted tool of orientation as it is neither true (chap. 2.1.d) nor meaningful (chap. 2.5.h).

The polycontextural model is an appropriate tool to solve the autistic-undisciplined thinking. It is not too difficult in a given problem – as with the relation wine and health (chap. 2.1.c), or *Helicobacter* and peptic ulcer (chap. 2.8.b) to define the different levels of environment. Moreover, it is to a certain extend possible to outline the meaning-giving relation between these different levels.

### 3.6 Bateson’s Frame and Content

Most important for the development of semantics was Gregory Bateson. It was a major step in the history of science when Bateson went to the zoo, asking himself how monkeys know that they play when they are fighting in a play. In the fundamental paper *A theory of play and fantasy; a report on theoretical aspects of the project for study of the role of paradoxes of abstraction in communication* (Bateson 1972: 177-193) he postulated that the monkeys signalise in a certain way that the showed action is not the meant action. He postulated a ‘meta-information’ determining the ‘uttered information.’



It was a very prolific approach from which Bateson developed his concept of 'frame and content'. It basically says that there is no statement or action as such. Everything happens in a certain frame and this frame gives meaning to the statement or action. There is always something 'outside' qualifying the content. For example, if you ask your partner in the morning if (s)he is angry because it seems so to you, (s)he might answer in a friendly way "oh yeah" or very strictly "not at all".

It is the way how things are said that determines the meaning, not what is said (Shintel 2006). This finding led to the development of a refined theory of communication (chap. 3.7).

The frame giving meaning to its content is omnipresent. A more formal presentation has been given in the chapter on polycontextuality (chap. 3.5). For the field of perception it is well established that the context decides on the perceived. Often it even overrides the evidence gathered by our eyes, causing us to imagine things which aren't really there (Zhaoping 2008). This fact constitutes a major problem in the eyewitnesses' evidence (Gottesman/Intraub 2003).

In medicine the frame/content issue is fundamental, as well. Its importance for the assessment of the measured values has already been demonstrated (chap. 2.7)

The following examples shall highlight some further implications and the wide applicability of this principle:

Is the dispute with the food industry to combat obesity a medical or a political issue?

The first important conflict with food industry arose when Nestle promoted formula feeding instead of breast feeding for babies in African countries. This led often to severe gastroenteritis and deaths, as most people had no clean water. Was the campaign 'Nestle kills children' political? If yes, is only the treatment of a dehydrated baby a medical action? And are breastfeeding campaigns a political, a social or a medical issue? This has again been under discussion when recently 50 000 children had been admitted to hospital and an unknown number has been exposed to long term harm through intoxicated formula milk in China (Coutsoudis et al. 2009). The answer to such questions, although of major importance for medicine, has nothing to do with the content, with facts. It is a 'frame'- decision.

Or: In the United States adverse drug effects rank fourth to sixth in the list of causes of death (Lazarou et al 1998) and one in 12 of older people is prescribed the wrong drug (Rauch Goulding 2004). Up to 6,5% of all admissions to hospitals in the UK are due to adverse drug reactions (Pirmohamed et al 2004) and adverse drug effects that

occur especially in elder people sum up to 5% a year (Gurwitz et al 2003). This can be seen as a good sign, as people are prevented from dying out of other causes, or as a bad sign indicating that drug therapy is often malpractice.

Or: Antibiotics are helpful, without doubt. However, their misuse is damaging. About six to eight million unnecessary therapies with antibiotics are estimated in the US alone for otitis (Hendley 2002). This leads to unnecessary side effects - which is an individual problem. It leads, as well, to the selection of highly pathogenic mutants - something that threaten us all (Levy 2002). Doctors are in the dilemma whether they should think of the individual or of the society first (Foster/Grundmann 2006).

Also it is unknown whether hospital treatment is really beneficial. Many found it harmful (Fisher 2003) and a reform of the health care system of veterans in the US showed that a reduction of the admission to hospitals is beneficial for the patients (Ashton et al 2003). Is it because older people who stayed in hospital commit more often suicide (Erlangsen et al 2005)? Is it because of nosocomal infects? Or is it because of medical injuries (Zhan/Miller 2003)? In the UK about 850 000 medical errors occur in NHS hospitals every year, resulting in estimated 40 000 deaths (Aylin 2004). In Spain, 6 of every 100 patients die in hospital due to adverse drug reaction, a study suggests (Universida de Granada 2008). Some even argue that going to hospital these days has become a bit of a lottery (Ananthaswamy 2003).

That is, the modern medical system can be seen as the best ever, or as harmful for mankind (Illich 1999, Wright 2003), suggesting that “if the entire pharmacopoeia were sunk to the bottom of the sea it would be all the better for mankind and all the worse for the fishes” (Holmes cited by Smith 2003d).

All these views have good arguments. Open fractures have a much better prognosis than 100 years ago, something true for most diseases. But the epidemiological reduction of mortality is not due to medical treatment (chap. 2.2). The answer to the question whether something is good, helpful or damaging lies often not in the facts, but depends on the criteria taken into account.

The fact that the meaning is a characteristic of the frame and not of the content is not only found in social behaviour. It is an integral part of every action in medical life, as already seen with the meaning of individual measurements (chap. 2.7). Every fact is polyvalent by its nature and true only in a singular context. It is therefore always necessary to ask for the logical theme under which an object shall be determined (Günther, 1979: 12).

Also this has already been seen very clearly by Bernard: “In science, ideas are what give facts their value and meaning. It is the same in morals, it is everywhere the same. Facts materially alike may have opposite scientific meanings, according to the ideas with which they are connected” (Bernard: 103).

### 3.7 Watzlawick and the Communication

Watzlawick et al. developed a theory of communication which had been based on the ideas of Russell and Bateson. Their book *Pragmatics of Human Communication* (Watzlawick et al 1967) belongs to the most influential works of the social sciences in the second half of the 20<sup>th</sup> century. Their 5 axioms of communication contribute important insights, relevant for the semantics of medicine.

1. *One cannot not communicate* (Watzlawick et al: 51)

Concerning simple communication it is obvious. The husband not answering the question: ‘Where have you been tonight?’ is highly communicating, as well as the child’s closing his eyes and ears when being questioned. The impossibility of non-communication is also important in every medical contact, in every therapy. There is no neutral stance of the physician and no *udeno-therapy* (chap. 2.2). A doctor cannot *not* treat. Whatever (s)he does has a meaning for the patient. Being friendly, reserved or rough has an impact.

Without a clear comprehension of this axiom the events observed in medicine cannot be described appropriately. Thus, this axiom will be treated in different forms throughout this work. Despite of the importance of communication in medicine, this issue is rarely investigated (Roter et al 2006).

2. *Every communication has a content and a relationship aspect such that the latter classifies the former and is therefore a metacommunication* (Watzlawick et al: 54)

This is Bateson’s concept of ‘content and frame’, just in other words.

Metacommunication became only lately a topic of brain research (Hamilton/Grafton 2006; Friederici et al 2006), involving the impact of mirror neurons (chap. 4.2) or *emotional body language* (Gelder 2006).

3. *The nature of a relationship is contingent upon the punctuation of communicational sequences between the communicants (Watzlawick et al: 59).*

Every communication consists of a sequence of events. Nothing happens out of nothing. This axiom says that the outcome depends on where we start to observe and how we construct the sequence. In a quarrel it goes like that: You said... - I did it, because you made... - I did it because you yesterday .... etc. The outcome (e. g., who is responsible) depends on the events taken into the frame of observation. This had already been proved by the mathematician Bolzano.

Given is a sequence

$$S = a - a + a - a + a - a + a - a + a - a + a - a + a - a + a - a + \dots$$

There are three possibilities to group it:

1. 
$$S = (a - a) + (a - a) + (a - a) + (a - a) + (a - a) + (a - a) + \dots$$

$$= 0 + 0 + 0 + 0 + 0 + 0 + \dots$$

$$= 0$$
2. 
$$S = a - (a - a) - (a - a) - (a - a) - (a - a) - (a - a) - (a - a) - \dots$$

$$= a - 0 - 0 - 0 - 0 - 0 - \dots$$

$$= a$$
3. 
$$S = a - (a - a + a - a + a - a + a - a + a - a + a - a + a - \dots)$$

$$= a - S$$

$$2 S = a \quad \text{or} \quad S = a/2$$

The result of the equation depends on the punctuation.

A typical example in medicine are multicentre trials. In combining the results of the centres in one way or another it is possible to prove either the effectiveness or the ineffectiveness of a therapy (Dubben/Beck-Bornholdt 2005: 137-156). Also the hen and egg question whether a gene function or a brain pattern is the cause or the consequence of a certain observed phenomenon belongs often into this category. May be it is no coincidence that in physics - a rather 'simple' science compared to medicine – the books and articles of the last 300 years rarely mention the word *cause*, and much less *causal chains* (Hanson: 51-52), notions still important in medicine.

4. *Human beings communicate both digitally and analogically. Digital language has a highly complex and powerful logical syntax but lacks adequate semantics in the field of relationship, while analogic language possesses the semantics but has no adequate syntax for the unambiguous definition of the nature of relationship (Watzlawick et al: 66-67).*

This axiom is probably the most underestimated of the five. Digital communication concerns a content, which might consist of words or numbers. Whereas the frame information is analogical.

The digital communication has (according to Watzlawick et al.) the advantage to be more precise, such that formal logic can be applied (and, or, if-then, no). Analogical communication is not able to do this, but has the advantage to reveal similarities and relationships. Analogical communication is said to have no negation. An example for analogical versus digital information is: “A bunch of roses says more than a hundred words” – but it is not so clear what it says.

The relationship between digital and analogical might better be demonstrated with watches. A digital watch gives us an exact time but the analogic watch more the feeling of time. In films, digital watches are used for count-downs, analogic watches are used when an appointment comes nearer. In sports, the digital result of a race gives a clear order, whereas the photography of the finish gives a very different (analogical) impression. The photographic outcome often does not seem to be as clear, precise and simple as the scoreboard suggests. However, we are used to believe more in digital signals.

Blood sugar testing is often done with test sticks. According to the blood sugar, the colour of the stick changes. With a reference table, the blood sugar can be estimated approximately (analogical method). The stick can be inserted into a machine, as well. Then the machine gives an exact value, let's say 132. Now, the result of the machine is not more exact than the eye (Kleesiek 2003), but everybody thinks it is because it shows a precise digital value, different from the eyes approximate (120-140).

Digital expressions are always precise. They cannot be different. The question is only, if there is any equivalent in the observed that is as exact as the description.

The neglect of analogical thinking is one main reason why current medicine has difficulties to describe and even perceive its own problems. It does not see that it does not see (chap. 3.3). The other extreme is traditional Chinese medicine which is extremely metaphoric describing even physiology in an analogical form (chap. 5.6).

5. *All communicational interchanges are either symmetrical or complementary, depending on whether they are based on equality or difference.*

This recursive concept of schismogenesis will be discussed later in detail (chap. 4.2)

### 3.8 Korzybski's Map and Territory

The analogy of 'map and territory' dates back to Alfred Korzybski. He introduced it to denote that there is a difference between a thing and its name, between a perception and its description, or between my neighbour and my opinion of her. The basic statement "*the map is not the territory*" aimed to explain the perception of schizophrenic people, as they tend to confuse the two (Korzybski 1941). This confusion is nothing else than the confusion of Russell's class and its elements.. The picture of 'map and territory' was very successful and became, after its introduction, widely used in the scientific discourse. It was especially Bateson who applied it to depict all sorts of logical problems.

Again I would like to cite Bateson, who was well aware also of this problem. Biologists, he said, studying living processes "*create* their descriptions, for even their most objective recorded data are artefacts of human perception and selection. A description can never resemble the thing described – above all, the description can never *be* the thing described" (Bateson/ Bateson, 1988: 151). This tool of 'map and territory' can be developed further to illustrate medical perception:

No map, as Bateson already referred to, can ever depict all qualities of a territory. The map only considers certain aspects.

Therefore different maps exist: geological, climatic, social or road maps. Every map is linked with a certain question. We could say that every map is a different answer to the undecidable question "How is the territory?". The instructions how to read the map, is laid down in the so-called *legend*. The legend is not part of the map, it is under the map or on a different page. It might even be missing, when it can be assumed that everybody knows how to read the map.

This depicts the known fact that the decision, how to interpret a content is laid down in the frame. It is never part of the content. This is often confused with objectivity. A geological map is not more objective than a climatic map, it is simply different.

The same is true for a diagnosis. A diagnosis based on physiological processes is not more objective than a diagnosis based the genetical disposition, on concepts of behaviour or on social communication. They only describe a content with different means. However, one might be more appropriate than the other in a certain context.

The already cited confusion whether a symptom or a diseases is treated (chap. 3.2) can clearly be solved with this tool. As diseases are maps and symptoms are points on a map, neither is treated.

Treatment concerns the territory (the patient). This will be further elaborated when it comes to the organisational closure of living systems (chap. 4.8).

Logically it can be said that treating a diagnosis would be the same as drilling oil on the geological map that helped to find an oil field. Mostly this fine distinction is not of importance. But one has to be aware of the fact that we are not working with truths in medicine but with concepts.

### 3.9 Peirce, Semiotics and the Magic of Medicine

Charles Sanders Peirce (1839-1914) presented an extensive logical work. As one of the first, Peirce was concerned with semantics, especially with signs and signification (**semiotics**). This part of his work has found an increasing interest in the last 30 years. Arts and artificial intelligence, both concerned with the question of how objects or facts express complexity, embraced Peirce's work.

Peirce's model, although not so easy to comprehend, shall be outlined in short:

Every object has certain qualities. These qualities are the *respect* or the *ground* how the object is categorized. But they are already an abstraction: "Moreover, the concept of a pure abstraction is indispensable, because we cannot comprehend an agreement of two things, except as an agreement in some *respect*, and this respect is such a pure abstraction as blackness. Such a pure abstraction, reference to which constitutes a *quality* or general attribute, may be termed a *ground*" (cited in Corrington: 120).

This resembles the modern notion of *affordance* as used in cognition research.

Respect, ground and affordance indicate that notions like quality and meaning are a characteristic of relations, but do not exist as such.

Peirce embeds this poly-contextural ground into a three valued system:

**Firstness** is the ground, the probabilities of an object. It is an "intersection of an unlimited number of contextures" (Günther, 1979: 289), before it is attributed to any context. It was especially Freud and psychoanalysis with the technique of free association to show the magnitude of possibilities each fact and symbol has for human understanding. Dreams are but a flow of firstness only slightly interconnected.

*Secondness* is the correlation of the sign to an object, its correspondence to facts. It involves causal concepts. All theories about dreams (Freudian, Jungian or neurophysiological) connect the unshaped world of pictures to an unobservable process. Peirce mentions fever as a sign for a deeper causal agent. Medical textbooks teach secondness.

*Thirdness* is the level that connects firstness and secondness. It is the level where meaning is created in a relationship.

To make an example: A national flag has no meaning as such. The pure pattern would be firstness. Only if it is correlated with a country and represents a country (secondness) it becomes meaningful. The use of the flag causes reactions not inherent in firstness or secondness. Burning a flag causes a different physiological reaction than burning old trousers, although the tissue (the ground) might be the same.

Basically, this concept of firstness, secondness and thirdness resembles the concept of content and frame, with thirdness as both together. Peirce's concept does not seem to be all too exact, as researchers often discuss if something is firstness, secondness or thirdness.

\*

Peirce's work is insofar remarkable as he made the study of signs and signification acceptable. In medicine there is a rudimentary theory of semiotics, found mainly in psychotherapy and in placebo research (Uexküll 2001; Walach/Sadaghiani 2002). In order to illustrate the importance of semiotics for the medical theory and practice I would like to make some examples.

Reference values have no semantic relevance. They are but deliberate limits (chap 2.6). But as soon as they exist, they serve as a sign that produces a complex behaviour on the side of the therapist. One colleague described something he called an “attack of vigintiphobia” (fear of the twenty). He became anxious when a home nurse called him an evening, saying that a baby had a bilirubin concentration of 20,5 mg/dl and she had started to do phototherapy at home. “Intellectually, I knew this plan was reasonable. But I was seized with an attack of vigintiphobia. I kept envisioning the child developing kernicterus. So I kept asking my wife to stop the film so I could fret about what to do. Ultimately, I did not call the home health nurse back to advise her to admit the baby to hospital, and of course the baby did just fine. But that evening the vigintiphobia was intrusive to the point that I remember thinking, ,Who needs this? Next time I'll just follow the guidelines and admit such



kids to the hospital, so I don't have to worry and can enjoy my movie” (Newman 2003). Every practicing physician knows similar examples.

Another example:

- Ferenczi presents in an article “*Alkohol und Neurosen*“ (1911) cases, where persons had an ‘intolerance’ against alcohol. They become drunk only by a few drops of alcohol and two persons become drunk just by seeing a filled glass. According to his psychoanalytical background, he interpreted this as a neurotic reaction connected to repressed instincts (Ferenczi: 92-96).
- Students in a bar were served tonic water. Half of them was told that it was vodka tonic. These subjects showed typical signs of drunkenness, difficulties in articulation and keeping balance. They were also more swayed by misleading post event information than were those who were told they drank tonic water (Garry 2003). This is normally called a placebo effect
- Only hearing the words like ‘beer’ or ‘whisky’ enhances men’s libido significantly (Friedmann et al 2005).

In the first case (neurosis) a person is treated according to a given concept. In the second case (placebo effect) it is mostly smiled at and somehow excluded from the scientific frame.

Both approaches miss the basic point: A sign (a sip of alcohol or the idea of drinking alcohol) produces a physiological pattern of reactions. Physiology seems to be organized around such signs and complex behaviour is triggered by them.

One of the first to investigate such processes systematically was Pavlov with his concept of conditioned reflexes. He showed that even immunological response can be triggered by signs and that signs play a key role in the processing of the nervous system and in physiology, as well (Pawlow 1933).

I remember the case of a lady over 70 who would not recover after her gallbladder was removed. She vomited whenever she drank or ate something. A lot of attempts with all kind of food and drugs were made. But all failed and provoked only vomiting. After one week she was really in a bad condition. Then she asked for some Champaign. The ward doctor allowed her a small bottle. From this time on she recovered quickly and was well after a few days - with her daily glasses of Champaign. This cannot be called neurotic. Also the characterization as a placebo effect seems to be inappropriate although it is hardly possible to attribute this effect to the pharmaceutical ingredients of the Champaign.

\*

It is futile and impossible to distinguish the object from its significance. This impossibility is supported by brain scan findings showing that imagination mimics the

brain reaction seen during 'real' perception. "From a cortical point of view, sensory acquisition and sensory processing are inseparable" (Bensafi 2003). The object and the memory of it, present and past cannot be separated. Neither theoretical nor practical. This is underlined by the finding that imagined pain creates the same neuronal pattern as felt pain (Derbyshire et al 2004, Berns et al 2006).

Signs not only trigger physiological processes, they express them as well in communication. They are *tokens for eigen-behaviour* as von Foerster called it (chap. 4.2). Perception, communication and reaction are deeply interlocked with the signs they represent. For example, reading the word 'smiling' activates the facial muscles used during smiling (Foroni/Semin 2009). Or, physical purity is strongly connected to moral purity. Participants in a test which had been exposed to a process of physical cleanness found certain moral actions to be less wrong than did participants who had not been exposed to these manipulations (Schnall et al 2008).

It seems that signification is the glue holding communities together. This is why we are able to perceive complex phenomena just by the signs they represent.

One of the first approaches to observe communication of the spouse by Soskin and John (1963) was disappointing, as their categories did not show any reliable effect. The authors found out that an anecdotal account obtains a clearer description of processes and interactions as all measurements based on analytic methods (Gottman: 15-17).

The problem with analytical reductionist methods is that the various contexts of a fact are reduced to one and symbols are excluded by convention. Thus, signification is not observable anymore and is often even regarded as unscientific.

Milton Erickson (1902-1980) was a psychotherapist and hypnotherapist. He was known for his unconventional interventions. "I always invent a new treatment in accord with the individual personality" (cited in Zeig 1980: 104). If he had a system, he never taught it. Although he is known as a highly successful therapist, he must be called unscientific in the orthodox sense.

He was a master in using signs and creating complex reactions through signification. One case was a Viet Nam veteran with broken spinal cord, bound to a wheel chair, having convulsive pain attacks every 5 minutes night and day (details in appendix III). Although he was operated twice, pain was not relieved. Erickson created a kind of scene. In the presence of the veteran he manipulated the clothes of the veteran's wife in a rather indecent way. During this tense sequence the man had no pain. Supporting

this experience of having no pain with hypnotherapy he was able to keep the patient free of pain (Zeig: 175-179).

All this is strange to a normal medical scholar. It seems to be an invasion of magical practices into modern medicine. This overlooks that the logical structure is not too different from biofeedback or TENS therapies. They do the same, but their 'magical' signification is in line with the scientific orthodoxy. It is an irony that every practitioner uses magical practices, that every surgery, every injection, every issue of a prescription has a magical component. It is impossible not to act magically (on the level of signs), as much as it is impossible not to communicate.

Every physician has a lot of examples belonging into this category, like the girl diagnosed with ADHD (chap. 2.2). One might object that these are single cases. It must be single cases as they concern the individual 'construction of reality'.

By the futile attempt of orthodox medicine to separate signs from signification, to "sift facts from meaning" (O'Hallon/Wilk 1987) the basics of perception and communication are violated.

What seems to be magical at first, is in most cases nothing else than a polyvalent logic taking the environment into account. This can be demonstrated with the well known example of different dimensions: A prisoner in a two dimensional world is safely locked up in a square. If this prisoner understands the third dimension he is able to leave the prison just climbing over the borders of the square. From the two dimensional point of view this would look like magic.

Similarly we often experience people just vanishing from the prison of disease. Cancers disappear, deep depressions change from one day to another, people rise from wheel-chairs and smaller magical moments are to be seen in our everyday practice (Duffin 2008). Often (how often?) these changes are triggered by some kind of sign or symbol.

### **3.10 Thomas Kuhn and the paradigm**

Rarely a term was as successful as Kuhn's *paradigm* introduced 1962 into the scientific discourse. Since then everybody is talking about a 'shift of paradigm' and nobody really knows what it means. This is not astonishing because Kuhn never defined the term accurately. He did not have the logical tools cited above, as they were only established at the time when Kuhn published his book. With these tools, it is easy to define what a paradigm is: *A paradigm is the decision of an in principle*

*undecidable question*. It decides on the axioms to be taken into account. It is Bateson's *frame* giving meaning to the facts.

A paradigm is, according to von Foerster, the result of a metaphysical act (chap. 3.4). Kuhn describes it that way: "The man who embraces a new paradigm at an early stage must often do so in defiance of the evidence provided by problem-solving. He must, that is, have faith that the new paradigm will succeed with various large problems that confront it, knowing only that the older paradigm has failed with a few. A decision of that kind can only be made of faith" (Kuhn: 158). However, the decision to follow the current, accepted paradigm is a decision of faith, either. It is also a metaphysical act, not a scientific decision. As it is impossible not to communicate, it is as well impossible not to decide on a paradigm.

The paradigm of a certain period is never explained. Actually, often it is impossible to explain it. Even logicians are faced with this problem within their own discipline: "When the neophyte asks 'What is mathematics?' or 'What is physics?' perhaps the best reply is: 'You can make up your mind as to that, after you have become acquainted with what mathematicians and physicists do.' The same general point holds true of logic" (Mattes: 3-4).

"The study of paradigms ...is what mainly prepares the student for membership in the particular scientific community with which he will practice" (Kuhn: 10-11). Becoming used to the official paradigm means to enter *normal science*. The best way to study the paradigm is to read a textbook on the subject. "When the individual scientist can take a paradigm for granted, he need no longer, in his major works, attempt to build his field anew, starting from first principles and justifying the use of each concept introduced. That can be left to the writer of textbooks. Given a textbook, however, the creative scientist can begin his research where it leaves off and thus concentrate exclusively upon the subtlest and most esoteric aspects of the natural phenomena that concern his group" (Kuhn: 19-20). The science based on textbooks is an *esoteric science*, laid down in journals and discussed on congresses, only understood by those belonging to this group. That is, when a paradigm is set, it is much easier to explain all related issues, something not true, when a new approach is introduced.<sup>8</sup>

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<sup>8</sup> This concerns also this thesis. It aims to support the introduction of a new paradigm into medicine. Thus many issues have to be explained at length which are evident for those acquainted with systems thinking.

An esoteric science based on the decision of an undecidable question brings up only decidable questions. Kuhn calls this process *puzzle-solving*, the main activity of scientists. “Mopping-up are what engage most scientists throughout their careers. They constitute what I am here calling normal science. Closely examined, whether historically or in the contemporary laboratory, that enterprise seems an attempt to force nature into the preformed and relatively inflexible box that the paradigm supplies. No part of the aim of normal science is to call forth new sorts of phenomena; indeed those that will not fit the box are often not seen at all. Nor do scientists normally aim to invent new theories, and they are very often intolerant of those invented by others. Instead, normal-scientific research is directed to the articulation of those phenomena and theories that the paradigm already supplies” (Kuhn: 24).

Such a paradigm possesses – it cannot be different – large unseen areas. This leads to the following situation: “Normal science, the activity in which most scientists inevitably spend almost all their time, is predicated on the assumption that the scientific community knows what the world is like. Much of the success of the enterprise derives from the community’s willingness to defend that assumption, if necessary at considerable cost. Normal science, for example, often suppresses fundamental novelties because they are necessarily subversive of its basic commitments. Nevertheless, so long as those commitments retain an element of the arbitrary, the very nature of normal research ensures that novelty shall not be suppressed for very long. Sometimes a normal problem, one that ought to be solved by known rules and procedures, resists the reiterated onslaught of the ablest members of the group within whose competence it falls. On the other occasion a piece of equipment designed and constructed for the purpose of normal research fails to perform in the anticipated manner, revealing an anomaly that cannot, despite repeated effort, be aligned with professional expectation. In these and other ways besides, normal science repeatedly goes astray” (Kuhn: 5-6). “Failure to achieve a solution discredits only the scientist and not the theory..... ‘It is a poor carpenter who blames his tools’” (Kuhn: 80).

In medicine there are many such anomalies: the excesses in neurology (chap. 2.2), the placebo effect (chap. 2.4), the findings of nutritionism (chap. 2.8.a), the development of chronic disease or the handling of multi-morbidity. Such examples represent the *anomalies* of the *normal science*, of the current paradigm. The current medical paradigm is not able to solve these problems. However, “though (scientists) might begin to loose faith and then to consider alternatives, they do not renounce the

paradigm that has led them into crisis. They do not, that is, treat anomalies as counter-instances, though in the vocabulary of philosophy of science that is what they are” (Kuhn: 77).

Kuhn’s approach is restricted. He concentrates his research only onto scientific contents. Thus he misses the meta-level of the frame. In medicine the students do not only learn ‘knowledge’ and study the paradigm. They learn, as well, how a correct professional has to behave, the correct *attitude* (chap. 6.1).

This part of the studies has been called the ‘*hidden curriculum*’ (Lempp/Seale 2004, Chen 2009). An investigation of the current hidden curriculum showed six major learning processes that medical students have to perform: loss of idealism, adoption of a "ritualised" professional identity, emotional neutralisation, change of ethical integrity, acceptance of hierarchy, and learning less formal aspects of good doctoring (Anbbasi 2004b). The decrease of empathy in medical students is well established and it seems that the current biochemical paradigm is a main contributor to this decline (Shapiro 2008).

## 4. Systemic Basics

### 4.1 Signal and Information

Information is a widely used term in modern society which has even been called the ‘era of information’. But there is much dispute on the question, what information really is. There are lot of different definitions and many a discussion fails, because there is no clarity what is actually talked about. A main problem is the confusion between signal and information. Many scholars advocate a concept of information more congruent with notion of signal.

First, I would like to suggest three possible definitions of ‘information’. They shall demonstrate the difficulty with this term. Simultaneously they shall exemplify how ‘information’ is understood and used in this thesis.

1. *Information is the difference that makes a difference.*

Bateson’s definition (Bateson, 1972: 453) has been widely accepted, but he himself was cautious about it. He stated that a letter that has not been written can be more an information than a written letter.

2. *Information is the interpretation of a signal. A signal is a disturbance in the universe in which the hearer who experiences a disturbance of the universe is embedded.*

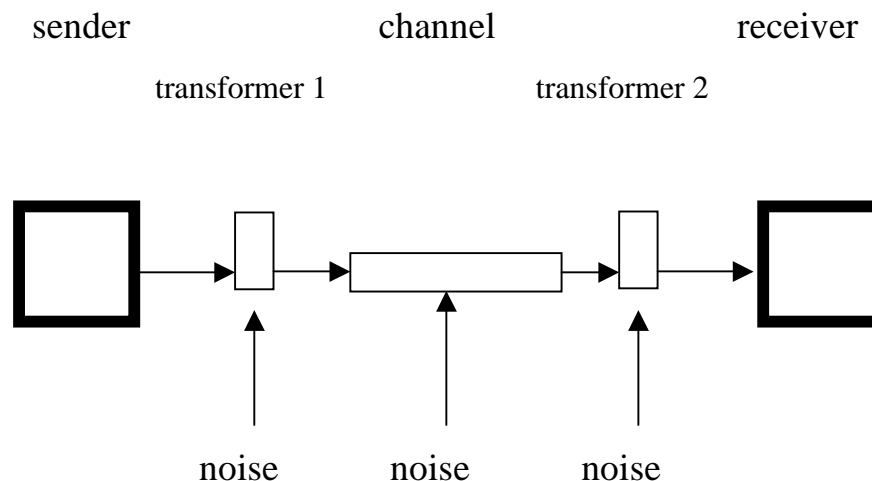
Von Foerster’s definition (von Foerster/Bröcker: 344, my translation) has the advantage of showing a relation between a signal and its information but it lacks the ‘information’ when something expected does not happen.

3. *Information is the smallest defined recursive unit.*

In self-organization information is embedded in a circular exchange of signals. The meaning is attributed to the semantic context (Jantsch 1979: 88). Out of this context an observer defines a unit, calling it information. However, also this definition is not able to overlook relational patterns, e.g., a signal that becomes an information only after a long period of time. It has also the disadvantage to be quite difficult.

The classic concept of information theory goes back to Shannon and Weaver who worked in the Bell Laboratories, researching telephone communication. What they called information theory should better be called “signal theory” (von Foerster/Bröcker: 343).

The classical concept of the transmission of a signal is



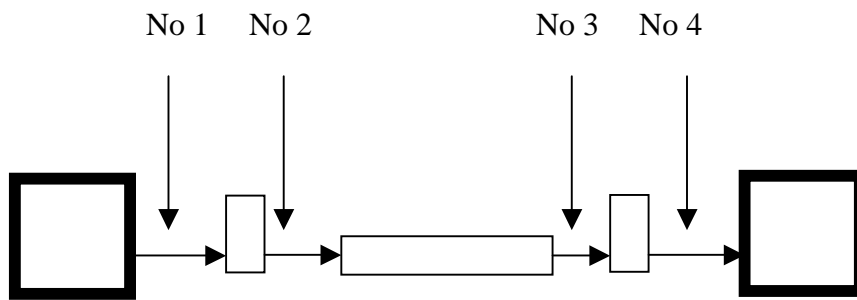
A sender sends a signal that is transformed by a first transformer, then transferred through a channel, retransformed by a second transformer and finally reaching the receiver.

This model fits quite well for telephone communication. The sound waves are transformed into electrical impulses, send through a cable or through the air and then are retransformed into sound waves. Everything that disturbs this process is called “noise”. So if I call my friend and my children put on their music, or the telephone crackles because it has fallen down too often, or my friend’s companion asks without interruption “whom are you talking with?”, all this is noise. And as a result we miss each other, because the time of the appointment was not clear.

More problematic is this concept if I write a letter to my aunt. I write (transformer 1), the post (channel) transports the letter to my aunt and she reads it (transformer 2). Here we have many possibilities of noise. I write awfully, the postman does not pay attention and raindrops fall onto the letter. And, after all, my aunts does not see very well. What does she read?



The signal changes through outer influences:



What of all this *is* the information? In classical information theory information is what reaches the receiver. This makes sense. If we want a satellite to go into the orbit of Saturn but it takes its way to Pluto, something went wrong. And the one responsible is not excused by explaining to the investigation committee that he had *sent* the right information, but unfortunately an eruption of the sun altered the signal. The committee will insist that he had not done his job correctly by not foreseeing that kind of noise and that the loss of 15 million Euro is his fault.

This notion of information corresponds to von Foerster's *hermeneutical principle* which says: *The hearer not the speaker determines the meaning of an utterance.*

However, this does not only mean that information is receiving a signal. It comprises, as well, its interpretation.

Therefore an informational program has information if and only if there is someone who hears or listens and for whom it is information. Out of five people, seeing the same program one might receive an information and four not. Von Foerster maintained: "The world contains no information" (von Foerster/Poerksen 2002: 95). This is not at all in line with our normal concept of information, where information is something that is sent.

To show the complexity of the issue I often present two photographs, both showing the same vulture (*Gypus fulvus*) connected with the question: *Which picture contains more information?*



There are 4 possibilities:

1. picture one has more information
2. picture two has more information
3. both pictures have the same information
4. both pictures have no information

Mostly answer one is preferred. But if we analyse the possibilities we find that the correctness of the answer depends on our criteria. If taxonomy is the main concern, answer one has to be chosen. Answer two is adequate if the normal human view is of interest. If we look at it formally (size, number of pixels), we have to choose answer three. Those who are bored by the game or don't like to decide find answer four appropriate.

What shall be demonstrated by that is

- the question of information is an undecidable question
- information might depend more on the interests of the observer than on the presented data
- there is no general information, information arises according to criteria

To make a simple medical example. 20 IU of insulin are a well-defined signal. But its information depends on the ability of the organism to react, so it is a different information for a normal person and for a diabetic.

The lack of distinction between the signal and its information has led to difficulties in the assessment of adverse drug reactions. Initially adverse drug reaction was classified in "type A reactions, dose dependent and predictable from the known pharmacology of the drug, and type B reactions, not dose dependent and unpredictable. This classification is simple; it helps drug regulation because prelicensing studies can reveal type A reactions, and it predicts that dose titration will reduce the risk of some reactions. However, it is sometimes difficult or impossible to assign a reaction to one type. For example, dose dependent (type A) nausea and vomiting due to erythromycin could also be classified as type B because it is not pharmacologically predictable.

Furthermore, other types of adverse reactions are not comfortably classified by the system. For example, osteoporosis from corticosteroids depends not only on dose but also on duration of treatment. And some reactions, such as asthma from adrenoceptor antagonists, do not occur in all patients. The classification has gradually been extended to other alphabetically labelled types, including type C (dose and time dependent (chronic) reactions), type D (delayed reactions), type E (withdrawal reactions), and type F (failure of therapy). These modifications have

mitigated some of the difficulties of the classification system but have introduced others” (Aronson/Ferner 2003). The authors, therefore, add patient susceptibility as a factor to dose relatedness and timing, creating a three dimensional model. This is, one must be clear, nothing than a rough map of an unknown territory. Due to the nonlinear nature of physiology nothing can be said why the receiver changes the way of perceiving the signal in time, thus altering the information.

Type E (withdrawal reactions) are of a different logical type I would like to call it the *engine driver type of information*. This type of information has to be considered carefully in order to understand the meaning of information.

An engine driver of a train has to push a certain button every some minutes. If he does not the train will automatically be stopped. Here the information is to receive no signal. It is a change of the a pattern, a ‘difference’ in Bateson’s terms.

This kind of information is crucial in order to understand organisation, as organisation highly depends on the engine driver’s type of information. This is most obvious in social organisations. From the ‘good morning’ that is an information if and only if it is *not* said, until to the last ‘good bye’ communication is characterized by an exchange of signals not meant as information but to uphold a structure (Bateson 1972: 9-13, Ivanovas 2003). In couples it was estimated that about two thirds of conversation is not to exchange information but a kind of “relation-changing” (Soskin/John 1963). In such a case the description of the signal is insufficient. Only a broader view reveals its sense. Something that is true as well for the description of metabolism.

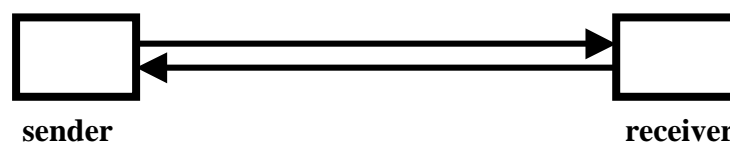
In a machine as in a train the process is clearly defined. It is a standardized reaction leading, if missing, to a standardized reaction. This is only possible when sender and receiver are structurally coupled, if there is an agreement on the meaning of the signal. In the case of the engine driver an observer will be able to understand how sender and receiver are interconnected, because the reaction is linear and immediate. However, the observer might not even realize that the pressing of a button has an important function for the journey, if he never experienced the stopping of the train. How often in the history of medicine doctors saw something as unnecessary and were surprised when the train suddenly stopped after they had removed parts of the body (tonsils, thymus, spleen) or suppressed inner regulations. The same is probably true for a lot of the so-called ‘junk genes’. Some scientists believe that “one in 200 of our human genes can be inactivated with no detectable effect on our health.”

(Wellcome Trust Sanger Institute 2009; Yngvadottir et al 2009).

In certain cases it might even be impossible for an observer to understand the procedure. When the management does not congratulate the employee to his/her birthday, this can be an important information changing the behaviour of the employee. An observer not customized with this tradition will not understand why all of the sudden the employee changes his behaviour. The same might be true in physiology. There might be a lot of reactions triggered by not receiving a certain signal. But we do not understand this and may be we never will, because it happens so rarely. As current research only lately is able to overview and conceptualise circadian rhythms, it would be arrogant to suppose that such rare events (every year or every 20 years) do not happen. Genomic contributions to the adult onset of neurodegenerative diseases suggest that such long time scales exist for physiological processes (Kennedy et al 2003). We have here a non-trivial situation where something that does not exist and can't be measured may change the behaviour of a system.

For understanding the information in a social context – something that has been called conversation theory (Pask 1975) – it has to be understood that the ‘agreement’ on how to interpret the signal (the legend, chap. 3.8) is never part of the content. How to code and decode a signal (or the missing of a signal) is laid down in the frame. There must be (or have been) a connection between sender and receiver. Otherwise a signal does not become an information. This relation is not static, but dynamic.

To send a signal meant as an information the sender must have already some information about the receiver.



Even in the army, with a highly standardized structure, the sergeant giving the instruction to his soldiers to turn right and to start marching has to know that there are soldiers (otherwise he will be put into a mental asylum) or that there is no abyss on the right.<sup>9</sup> Social information only exists as an exchange of information. It is a recursive process.

The same is true in the medical context. If the relation between sender and receiver is shattered we have severe states of disease.

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<sup>9</sup> This refers to an example of von Foerster who maintained that in the military command the notion of signal and information are identical (Foerster/Bröcker 2002: 345). In opposite to his opinion I claim that also in this context information has a recursive character which exceeds the linear idea of the signal.

## 4.2 Recursivity and Self Fulfilling Prophecies

Recursivity arises if a result of an operation is again the starting point of the same operation (von Foerster 1984).

If we make a first operation

$$x_1 = \text{Op} (x_0)$$

and continue with the same operator

$$x_2 = \text{Op} (x_1)$$

we come, continuing this process long enough, to the formula

$$\lim_{n \rightarrow \infty} \text{Op}^{(n)} = \text{Op}_o$$

The result of the limes operation might be (Zimpel 2005)

- Infinite or stable values.
- Bi-stable or n-stable values after a few iterations.
- An unsolvable operation such as the division by zero.

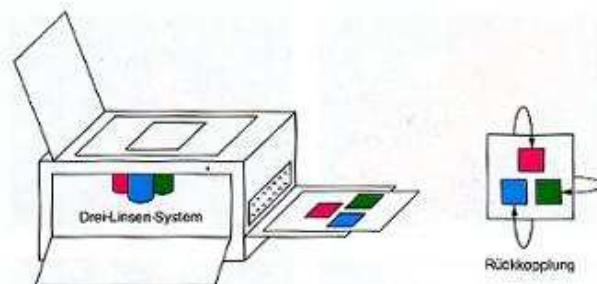
Von Foerster emphasized especially the stable value. He exemplified such stable outcomes by extracting the square root of a number. Irrespective of the starting number ( $n > 0$ ), the result will always be one. The result is not determined by the operand but by the operator.

Thus, such a recursive operation leads to a result that is characteristic for the operator.

Von Foerster called this phenomena *eigen-behaviour* of the operation.

\*

This is a general law. Its validity can be shown in many different ways.



*Optically:* When photocopies are made with a three-lens system, the result is a triple photocopy.

A recursion is when a copy is made from the copy. Already after the sixth passage we have a stable picture, a *limes picture*. In such a



limes picture the result looks the same, regardless whether the copied object is a triangle, a square or even a word (Jürgens, Peitgen & Saupe 1989). The shape of the limes picture, its eigen-behaviour is determined by the structure of the copy machine not by the shape of the copied item.<sup>10</sup>

*Acoustically*: If we feed a sound machine with a certain piece of music, the machine will transform the music according to certain principles. When the machine is recursively fed its own product the outcome will be, after some time, a stable sound, regardless whether the starting point was classical or rock music. The here presented examples are the Gnossienne No.1 by Satie and a bit of rock music by Nirvana, recursively processed by Knut Auferman.<sup>11</sup>

\*

A recursive system with a stable operator will develop (if there is enough time) the same eigen-behaviour independently of its original state. This process can be called *trivialisation*. If there is not enough time it will, at least, approach its eigen-behaviour. On the other side: *Even a small change in the operator will lead to far reaching changes in time*. This might explain delayed side-effects of drug therapy or how major changes can be attained by small interventions (chap. 5.3.e).

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All living is organized in a circular recursive way. Thus, physiological and biochemical processes follow the same pattern. In fact, the human cannot be understood without a clear concept of recursivity. Best known is the recursive neuronal self-organization. For example, perception modifies the neuronal connections in the visual system thus modifying perception (Chiu/Weliky 2003). Recursive processes are also the driving force in the development of all social behaviour (Zimpel 2000).

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Piaget was a forerunner in the study of recursive senso-motoric interactions. He studied the development of cognition in babies and children. He found that the different senses are interconnected: Perception interprets motion and motion interprets perception thus leading to a stable cognition (Piaget/Inhelder 1966). His concepts have been further developed by von Foerster (von Foerster 1976) and Zimpel (Zimpel 2005). Lately brain research is able to demonstrate some neurological foundations of

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<sup>10</sup> Illustrations by courtesy of Hartmut Jürgens. More details in H.O Peitgen, H. Jürgens, D. Saupe, "Bausteine der Ordnung - Fraktale", Klett-Cotta, 1992

<sup>11</sup> Available under <http://www.systemic-medicine.eu/Chap/4.2.recursivity.html>

these recursive processes (Gottlieb/Mazzoni 2004). However, it is still preoccupied with rather simple connections, like sounds improving the learning of visual tasks (Seitz 2006, Smith et al. 2007).

\*

The development of eigen-behaviour and the process of signification are not separated. Thus, an object is not only an object *an sich* (as such). It is at the same time a sign for itself. Von Foerster called such a sign a *token for eigen-behaviour*. For a more formal deduction of this process see Rocha (1996).

\*

Recursive processes are difficult to understand. Actually, they are mostly misunderstood. When *Science* magazine tried to explain recursivity, it chose as an example the *Babutschka*, the Russian puppet in a puppet in a puppet (Premak 2004). But the Babutschka is totally linear, no recursion is involved. This is a typical misunderstanding, often found in scientific papers. To generate a feeling for recursive processes and to demonstrate certain of their impacts, I would like to present a series of examples that are more or less connected with medical practice.

\*

One of the first to analyse recursive interactions was Bateson. His concept of *schismogenesis* describes a pattern that leads to discord and rift. Based on the principle of action and reaction he demonstrated that severe problems arise when a certain kind of interaction remains unchanged (Bateson 1972: 61-72). He distinguished a symmetric and a complementary form of schismogenesis. The symmetric form prevails when one party tries to go one better as the other with the same means. This is seen in an arms race, in market competition, in sport events or in the race to the moon. The film *War of the Roses* demonstrated it for couples. The other form, the complementary schismogenesis, is much less sensible. It happens when the mutual reaction is somehow in opposition. This can be often observed in couples (example in appendix V). When one partner, let's say the wife, likes a little bit more conversation than the husband, she will talk more than he likes. As a reaction he will talk less. But this is too little for her, so she will talk more. This makes him talk even less. If this pattern continues for some time there will be a nagging wife and a frozen husband. There is no cause to be elaborated. The film *Dogville* showed this kind of schismogenetic pattern. It also can be seen in the *Stanford Prison Experiment*.

\*

Such recursive processes are called positive and negative feedback mechanisms. A *positive feedback* is the recursive loop stimulating itself leading to a cascade or an exponential development. It is seen, for example, in aggressive behaviour. Areas of the hypothalamus controlling aggression release adrenocortical hormones that stimulate this region (Kruk et al 2004). The resulting sudden explosive development of aggression is familiar to all of us. The positive feedback mechanism guarantees a quick response, crucial under many circumstances. Immune response is characterized by a whole set of comparable cascade effects. For example, immune cells multiply exponentially.

Such interactions involving a positive feedback mechanism are very *sensitive to their initial conditions* (Heylighen 2008: 4). In immune response “the difference between health and disease could be the ‘stochastic’ activation of a single cell, followed by positive feedback” (Germain 2001). It follows also, that *positive feedback mechanisms are essentially unpredictable*. Even unnoticeable changes might have an enormous impact.

\*

The cascade effects are controlled and suppressed by *negative feedback* mechanisms. They recursively inhibit their own expression. This has already been seen with the liar’s paradox and the electric bell (chap. 3.2). A typical example in medicine are the clock genes of every cell. They produce a ‘period protein’ that regulates negatively their own expression with a time delay thus producing an inner rhythm (Gelder et al 2003). Or: Osteoblasts release a substance (RANKL) that promotes osteoclast maturation and activity (Marx 2004b). In this example two partners (osteoblasts and osteoclasts) are involved to produce the negative feedback mechanism. Or: Immune cells produce the cytoplasmic protein A20 which activates a self-limiting mechanism thus preventing septic shock and other inflammatory processes (Boone et al 2004). *Negative feedback mechanisms are more predictable than the positive feedback mechanisms, but they are also less controllable* (Heylighen 2008: 4).

\*

The dynamics of complex systems typically exhibits a combination of positive and negative feedbacks, such that certain changes are amplified and others dampened. The relation between Th1 and Th2 lymphocytes is such an example. Th1 inhibits Th2 and vice versa (Schwartz 2002). This is a feedback mechanism, although ‘negative’ as one partner impedes the other leads to an increasing difference between the two.



Actually, it is a complementary schismogenetic pattern which plays a central role in the development of chronic disease. This Th1/Th2 relation is controlled by other feedback mechanisms, otherwise the system would never be stable. One of these mechanisms are the receptors of interleukin-7 (IL-7). As soon as the cell receives IL-7 it reduces its receptors on the surface (Park et al 2004), a typical negative feedback loop.

*The coupling of positive and negative feedback mechanisms makes a system's behaviour both unpredictable and uncontrollable* (Heylighen 2008: 5).

\*

Autoimmune disease is characterized by lymphocytes which bare receptors against autoantigenes. Some of these autoreactive lymphocytes persist within the peripheral lymphocyte pool. Current evidence shows that they are controlled by other lymphocytes which are necessarily autoreactive to themselves (Kronenberg/Rudensky 2005).

\*

If test persons are shown two photographs and are asked which of the depicted persons is more attractive, they prefer the photograph they look at longer. The longer they look the more beautiful the person on the photo appears. People gaze at what they like and like more what they gaze at, something the authors call a cascade effect. When the test persons were not allowed to move their eyes no correlation between the duration of exposition and preference could be detected (Schimojo et al 2003). Here the interplay of recursion, movement and signification ('beauty') can easily be observed. The findings are in line with Piaget's cognition theory.

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Sacks reports many cases where parts of the body vanish from inner representation through immobilisation (chap. 2.2). Only the incessant movement of the body maintains the body-scheme on the cortical level. Already after some hours limbs can be erased from the inner representation. It is the motion that creates a picture of the body, but the picture of the body is necessary to make movements. If this recursive process is interrupted, patients might be unable to move or even perceive parts of their body. They seem not to belong to the self anymore (Sacks 1984).

\*

Every social behaviour is based on recursive processes. A child throws leaves in the air, another child does the same. The children are thus getting connected and start to

play with each other. People talking to each other take the same or a similar posture, putting the finger at the chin, crossing legs etc. This process has been called *mirroring*.

Mirroring has its neurophysiological equivalent in the so called mirror neurons in the frontal lobe. "These neurons are active when their owners perform a certain task, and in this respect are wholly unremarkable. But, more interestingly, the same neurons fire when their owner watches someone else perform that same task" (Motluk 2001a). However, mirroring is not restricted to the frontal lobe but includes also the function of the amygdala and of other brain structures (Gelder 2006).

This means that to a certain extent there is no difference between me and other on the neuronal level. This has been shown in many regards

- In the processing of the brain it makes no difference whether someone makes a mistake or observes someone to make a mistake (Shie et al 2004).
- People who are empathically connected show the same neuronal activity whether they receive a painful stimulus or the other. They experience the pain without neural stimulation (Singer et al 2004).
- The excitability of the same muscles is increased when a test person is needled or observes the needling (Avenanti et al 2005).
- Observing others in a fearful posture activates the neurophysiological centres connected with fear (Gelder et al 2004).

Mirroring is a kind of structural coupling (chap. 4.8) between humans that exceeds previous theories of social development by learning. And it is not limited to seeing. To hear someone yawning might induce a mirroring effect in ourselves. But it is often sufficient to think of someone yawning to induce a physiological effect. That is, mirroring in a wider sense does not only exceed the distinction between me and other. It also exceeds the concepts of past, present and future. The semiotic aspect is included. This can be seen in the fact that a word like "wheezing" is able to induce asthma attacks in asthmatics (Rosenkranz et al 2005).

As families have similar brain structures (Motluk 2001b), it can be expected that mirroring is more intense between them. That is, the question whether something is inherited or acquired cannot be answered as clear as assumed. Probably behaviour is much more acquired than thought, but this behaviour is interwoven with genetic expression. It is no surprise that a recent twin research attributes only a small fraction of coincidences in the behaviour of twins to genetic disposition (Hughes et al. 2005). But such conclusions depend probably more on the frame (chap. 3.6) and on the punctuation (chap. 3.7) than on the data.

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Language is learned through a recursive process. Meaningless sounds of infants are reinforced, giving them simultaneously an intersubjective meaning (signification): “mamamama” – “Oh yeah, say ‘mama’”; or: “This is a spoon” – “oon” - “Very good, spooooon” - “oon”. The stable eigen-behaviour is the common language. The acquisition of language does not necessarily follow this pattern, as children cannot be kept from learning a language even if there is no reinforcement. They do not learn the language but the whole system of semantics. Children seem to learn the frame factors and structure at first and are only later concerned with the content (Dewhurst/Robinson 2004).

But they need to be in communication. Just hearing a language (the content) without recursive interaction does not show any effect (Kuhl et al. 2003).

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Children in a deaf school in Nicaragua developed their own sign language with its own grammar (called a ‘big bang of language’) just communicating with each other. It seems that the only thing needed to generate a language is enough people to communicate. A deaf child in a family without a supporting system is not able to do this (Breuer 2000). It stays without the possibility of complex thinking. Deaf children remain in a state of debility if they do not learn to communicate (Sacks, 1989). The same is true for totally neglected and deprived children who have no ‘social input’ (Zimpel 2004).

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Communication creates abilities. Abilities create communication. It is structurally (genetically) determined to learn a language. Through the interaction with the environment a certain language is learned. It might as well be a sign language. Lately, Chomsky and colleagues gave a more specified concept of language and communication taking recursive elements into account. They differentiate between the faculty of language in a broader sense (FLB) and the faculty of language in a narrower sense (FLN). FLB is the faculty of communication, which is common in all animals and does not change through social contact. FLN is a recursive product with open-end possibilities and as such only existing in human beings (Hauser et al. 2002). Hauser and Fitch showed in experiments with monkeys that it is exactly the lack of recursive action that limits the development of language in animals (Fitch/Hauser 2004). An editorial related to Fitch and Hauser’s article asks: “Is language the key to

human intelligence?” (Premack 2004). This can be definitely answered with no. Recursivity is the key to human intelligence.

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In the late sixties and early seventies there was an intense discussion about self-fulfilling prophecies. It was said and proved and disapproved and proved again that the expectations of the teachers lead to the expected behaviour in a pupil. This has been called ‘Pygmalion in the classroom’, Pygmalion- or Rosenthal effect (Gumpert/Gumpert 1968, Spitz 1999).

This effect has been defined as a “behavior that brings about in others the reaction to which the behavior would be an appropriate reaction. For instance, a person who acts on the premise that ‘nobody likes me’ will behave in a distrustful, defensive or aggressive manner to which others are likely to react unsympathetically, thus bearing out his original premise” (Watzlawick et al: 99).

It is not difficult to develop models, *how* it is possible that the expectations of a teacher leads to the expected behaviour: The teacher, driven by his expectation, shows a certain behaviour towards the ‘bad pupil’ that slightly differs from his behaviour towards other pupils. Even if it is only a little depreciating, the pupil will react (as it is impossible for him, not to react) and he will behave a little different than other pupils. This reaction might serve as a confirmation for the teacher that his ‘information’ of a ‘bad pupil’ was right. In their communication every recursive loop then might deepen the problem. It is a typical schismogenetic pattern.

An important, but unanswerable question is: Who is responsible? The teacher as he behaves according to the information he has got? Or is it the pupil because he does not work properly? Or is it the adviser?

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The parents’ belief is the best factor to predict a child’s alcohol consumption later. When one or both parents overestimate the alcohol consumption of their child the probability that the child will increase drinking is very high (Madon et al 2004).

\*

Women are bad in maths. They know that. When given a test and been told that the test might activate negative stereotypes about women's math ability, women performed worse than when they were told nothing. The effect is more prominent when men are present (Kersting 2003).

\*

The memory of 90 healthy older people was tested. When positive words like “guidance,” “wise,” “alert,” “sage” and “learned” were flashed during the test, memories were better and people even walked faster. When negative words like “dementia,” “decline,” “senile,” “confused” and “decrepit” were flashed, subjects’ memories were worse, and their walking paces slowed (Kolata 2006).

\*

Children of single parents have more problems than children with two parents. Everybody knows that. A recent study (Weitofte 2003) shows that these children have an increased risk of psychiatric diseases, suicide or suicide attempt, injury and addiction. It is a severe problem. All single parents know this burden and many feel guilty. They live in an atmosphere of uncertainty and shame. This atmosphere is the ideal breeding ground for an abnormal behaviour. It is inevitable that children in such an atmosphere behave strange. And even if they don’t, a slight abnormality that might be thought of as a normal problem of adolescence in other children is interpreted as a consequence of the single parent status. Then all kind of helpers (doctors, psychologists, social workers, teachers, kindergarten teachers and neighbours) will intervene and deepen the conflict by creating a Pygmalion effect. Science is no help in this situation. Even if the first study about the children of single parents were false, the spreading of this ‘knowledge’ through radio, television and hundreds of newspapers, through paid and non paid helpers makes it a self-fulfilling prophecy and the second or third study on the subject will, this time correctly, find: “Yes! Children of single parents have more problems!”

With some legitimacy it is possible to state that psychological studies create the problems they find. The question how it *really* is makes no sense: It is an in principle undecidable question.

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It is normal to wake up several times a night, as the idea of a continuous sleep is a cultural myth (Moodallem 2007). The problem starts when waking up is seen as problem. Then, the very idea of having a problem prevents sleep (Bachmann/Steinilber 2004). A real disease is created, when the physician gets involved and prescribes drugs. The person attains the official status of a patient, takes drugs which cannot be discontinued easily, as the rebound effect provokes sleeplessness. Actually, half of the patients with sleep disorders receive drugs like benzodiazepine (chap. 4.8) which might lead to addiction (Balkrishnan 2005).

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Breast feeding is recursive. The mother produces the amount of milk to a certain time according to the demands of the infant. The aim of helpers is often to avoid a negative impact of breast feeding onto the growth of the child. The infant is sometimes weighed before and after drinking. Then the drunk quantity is compared with a table of reference values (established on formula-fed babies which overestimates the necessary weight increase). Afterwards the ‘missing’ quantity is administered by bottle. This prevents the mother to produce a sufficient quantity of milk, as the demand is restricted, making the gap between produced and ‘needed’ breast milk ever greater (Declercq et al. 2009). This is just another typical example of a self-fulfilling prophecy where well meant measures (weighing, schedule, positions, etc.) to prevent problems create the problems they pretend to prevent.

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An important question in the handling of such recursive process, of such self-fulfilling developments is: *What kind of control is intended* (chap. 6.5).

### **4.3 Higher Orders of Learning**

Bateson was one of the first to investigate the principles of second and higher order phenomena. He showed that a concept of higher order is necessary to understand the course of events observed in biological and social adaptation.

Second-order or self-referential problems are those problems who need themselves to be solved. Language needs language to be discussed on. Thoughts need thoughts to be thought of (von Foerster, 1999). Science needs science to be investigated.

Such a second order sight has enormous consequences. It constitutes a different logical class (chap. 3.2), a different way to observe processes. This does not only allow different insights. It introduces simultaneously uncertainty (chap.3.3) and meaning (chap. 3.5). The second order view is not a theoretical construct. It is a model much nearer to the events in nature than the usual linear model.

This shall be demonstrated with a main field of research of Bateson, the idea of a *learning of a higher order*. His concepts underwent several changes during his lifetime (overview in Lutterer: 123-140). A reason might have been that one of his basic assumptions – the axiom that acquired characteristics cannot be transmitted – was wrong. Despite this shortcoming, Bateson’s categories are a most valuable tool to

understand medical events. The impact of this concept shall be illustrated with the immunological reaction to germs.

Bateson distinguished five types of learning (Bateson, 1972: 279-308).

### **Zero learning**

“This is the case in which an entity shows minimal change in its response to a repeated item or sensory input” (Bateson, 1972; 283). This is seen in simple mechanical circuits or in living organisms that are overstimulated, or where the response is structurally fixed. In medicine learning 0 prevails when under similar circumstances a certain infection reoccurs. Some people develop tonsillitis having a cold, some women suffer from herpes labiales during every menses. Also short term death after an infection should be regarded as learning zero.

Zero learning is also the main assumption for most drug therapy. It is expected that the organism reacts repeatedly the same and does not adapt. Adaptation is often regarded as unfavourable.

### **Learning I**

This is the typical learning investigated in laboratories. It measures to what extend and in which time a human is able to solve a mathematical riddle or to remember nonsense syllables. Learning a language is Learning I. This type of learning is also the learning normally investigated in medicine. It is, for example, the development of a lifelong immunity after an infection or vaccination.

### **Learning II**

Bateson called this type of learning also *deutero-learning* (Bateson 1972: 159-156), a second order phenomenon. It is learning to learn. Someone who learns nonsense syllables is, after a few tests, able to learn nonsense syllables more easily, or might even remember numbers better. Or if someone learns a language he does not only learn the language, but learns, as well, how to learn a language. Then, the next language is learned more easily (Schweizer Nationalfonds zur Förderung der wissenschaftlichen Forschung 2009)..

This second order learning cannot be detected by a simple measurement. It needs a series of similar experiments and their comparison. The measurement as such does not mean anything. It is the difference between the measurements that reveals learning II.

In a remarkable experiment Bateson worked with porpoises. Normally these animals are trained in learning I. That is, whenever they fulfil a task they are rewarded. Under

Bateson's directive the animals had been only rewarded when they showed a *new behaviour*. It was hard work for the animals until they understood this principle. But then it was easy for them to invent new tricks (Bateson 2007). This is obviously a different kind of learning than the usual and linear learning I.

In medicine one might see learning II under the following circumstance: When after a vaccination against flu, for example, the morbidity against this kind of flu is reduced we have a simple learning I effect. When, however, all-cause mortality is reduced, as had been seen in some studies (Voordouw et al 2004), we have a learning II situation. That is, the vaccination had more profound effects than only to induce the production specific antibodies. Such effects are by no means an 'unspecific' reaction. They are absolutely specific, yet on a different logical level.

Examples of such a decrease (or an increase) of all-cause mortality after vaccinations have already been discussed (chap. 2.8.c). The same is true for all kinds of 'natural' infections like the persistence of a germ inducing a 'cross-protective immunity', which is a second order phenomenon (chap. 2.8.c), like the GB virus or measles leading to a survival advantage in AIDS. It can be expected that all infections have such a second order impact, exceeding the simple 'specific' immune response.

### **Learning III**

Bateson refers to learning III as an experience that totally alters the life style of a person, involving the complete being. According to him, such a change might be seen after an important religious experience. I propose that a change from a linear point of view to a systemic view is also learning III. Such a learning changes fundamentally the understanding and handling of data. It is on a higher logical level than learning II and has little to do with specific issues.

In the immune reaction learning III occurs when an acute infection is the starting point of the improvement of a chronic disease. A classical example are the worm infections improving asthma (Wilson et al 2005) or Crohn's disease (Summers et al 2006). That is, an infection might have a beneficial effect for the function of the human in general. This type of learning (where infections improve the general health condition) is also the core of the *hygiene hypothesis* (chap. 2.8.b).



## **Learning IV**

Bateson subsumes under this heading the changes in the learning structure, that is, a change of the genetical adaptation. In Bateson's times this was only attributed to the evolutionary selection. Therefore it was expected to take many generations. Recent research on *epigenetics* shows, however, that this type of learning plays an important role not only from one generation to the next, but might even be important during one lifetime. Genes have memory (Bird 2007). Accordingly, learning IV is closely interwoven with the other levels of learning and cannot be separated decisively.

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*Excursus I (the reality of learning of higher order)*: This reflection leads necessarily to the question, in how far these categories represent a reality. Tomaras believes that they are only a metaphor (Ivanovas et al. 2007). In this view the concept of a higher order would be a kind of mnemotechnical device, a reminder not to forget certain aspects in an otherwise complex situation, as the interactions of the helmintho-bactero-viral flora. Moreover, in the reductionist approach, under the microscope or in the test tube no higher order exists. There are only reactions, often unrelated, at times inconsistent. In fact, the immune response cannot be understood on a cellular level. "As one dissects the immune system at finer and finer levels of resolution, there is actually a decreasing predictability in the behavior of any particular unit or function (a gene, a cell)" (Germain 2001).

That is, in order to describe what happens in the immune response, its organisation has to be understood. This is not possible without teleological (chap. 4.7), and polycontextural (chap. 3.5) concepts introducing the notion of 'meaning'. In such a view it becomes necessary to distinguish between different logical levels, between the learning of a first, second or third order. Although it might be a strange procedure for an analytically trained scholar to use such seemingly vague concepts. Nevertheless, it is a difference whether a certain trait is trained (as in behaviour therapy) or whether the ability to find own and new solutions is supported (as in systemic psychotherapy; chap. 5.2). Likewise, different approaches exist also in general medicine and in drug therapy (chap. 6.8; 6.9). For the general practice it is of minor importance, at first, whether these different categories represent a *reality*, whether they are of the observer or of the observed. Important is the impact they have for the general practice.

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*Excursus 2 (epigenetics):* The knowledge on epigenetics is still quite rudimentary although related observations mushroom. The following sample shall just give an impression of what is attributed to epigenetics today.

- The nutritional status of grandfathers before adolescence has been found to be of major influence for the health of their grandchildren. A period of famine, for example has a health protective influence in the grandchildren. (Kaati et al. 2002).
- Good baby care in rats activates some genes in the hippocampus. This activation remains for generations and these rats show more care for their babies (Weaver et al 2004).
- Genetically similar fish have different gene expressions according to their lifestyle and genetically different fish have a similar gene expression when they share the same way of living (Giger et al 2006).
- Environmental stress changes plant physiology over generations (Molinier et al 2006).
- In mice the enhancement of memory through environmental conditions is transmitted to the offspring. This happens even in mice with a genetic defect impairing their memory. In the offspring this genetic defect is ‘masked’ (Arai et al 2009).

The mechanism of how acquired characteristics are inherited is attributed to the small RNA (sRNA). It can activate, deactivate or even cut off parts of the genome. It is the regulator of the master regulators (Couzin 2008). This discovery was classified as “The Breakthrough of the Year 2002” by SCIENCE magazine (Couzin 2002).

Until now, we have but hints what is transmitted and how. It is known that a given genotype can give rise to different phenotypes depending on environmental conditions. The current evidence is, however, sufficient to state that the epigenetic mechanisms are of major importance for all kind of health issues (Blech 2008b). Single nutrients, toxins, behaviour or environmental exposures of any sort can silence or activate a gene without altering the code (Duke University 2005). Such responses to the environment may be expressed in the offspring rather than in the parent and might persist across a number of generations, even if the environmental factor itself has altered (Bateson et al 2004).

But the process is even more complicated. *Arabidopsis*, a plant, violates mendelian genetics by restoring a DNA-sequence of the HTH-gene that is found in the grandparents but not in the parents (Lolle et al 2005). That is, the inner organisation is able to change and restore the genome according to certain plans. It seems that the whole process of genetic transmission is extremely recursive. It even became quite doubtful what ‘inheritance’ really means (Jabolka/Lamb 2005), as genes are “only marionettes in the hands of enzymes” (Kaati 2002, my translation).

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*Learning IV in medicine* would be given, at least according to Bateson, when the following generations benefit from an infection of their ancestors. This subject has already been touched (chap. 2.8.c). Measles, varicella and other viral diseases had been rather lethal when they first came to the new world. The same was true with syphilis which – according to the prevailing theory – was brought back by Columbus in return. After some time all these diseases became less aggressive. Even people who never had any contact with the germ before and probably did not possess specific antibodies had milder forms. Former theories could explain this only by selection. It was supposed that the more susceptible people just died away, such that the surviving population was genetically more resistant. However, this theory had never been really convincing. It is not probable either that all germs change when they remain in a new population. It is likely that this learning has a strong epigenetic component. But also the whole ecological context, as the helmintho-bacterio-viral flora and other factors, might play a role. As this has been defined as learning III before, there seems to be no clear distinction between learning III and IV. After all, there might be no need for such a logical category as learning IV. It had had a sense when genetics was still a trivial science, when causal chains like “DNA makes RNA makes protein” were prevalent. But as today the words gene and genome have lost their decisive meaning and are used rather inconsistently (Angier 2008) the notion of pattern (chap. 4.9) might be more appropriate to describe the course of events in transmission. Regardless of all the recursive imponderability around heredity, there exists a concise case of learning IV. A considerable amount of the genes is of viral origin, as viruses are able to enter the genome (Zimmer 2008). This is best known for the endogenous retrovirus. These genes are possibly beneficial for the humans. There is, for example, some evidence that they are essential for a healthy pregnancy (Society for General

Microbiology 2008). As the understanding of the virus – genome interaction is new, more results are to be expected in the near future.

The question, whether it is useful to maintain the logical class of a learning IV is no trivial question. It goes right to the core of the relation between structure and function. One might discard this distinction as outdated. Then the viral genes entering the genome would be only an extension of the organism's steering mechanism. But such a progressive view is rarely found.

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It would be a mistake to believe that learning through germ contact only induces positive effects. An infection often has severe side effects like glomerulonephritis after a streptococcal tonsillitis (learning I). An infection might promote or worsen other infections (learning II). Infections might lead to a total change of the human function (learning III). This is seen in many chronic diseases, and lately a whole range of such chronic diseases are attributed to infections. This so called *germ theory* (Edwards 2002) is actually the opposite of the hygiene hypothesis. It believes that chronic diseases are caused by bugs (Edwards 2002). Helicobacter and peptic ulcer is the classical paradigm. But infectious agents are increasingly attributed to all kind of chronic states with a disturbed immune balance (Morens et al 2004), mainly cancer (Clifford/Francheschi 2007) e.g., childhood cancer (McNally 2005) or brain cancer of the adult (McNally 2006). But also Alzheimer's disease (Wozniak et al. 2008), diabetes (Sobngwi et al 2008), multiple sclerosis, systemic lupus erythematosus, rheumatoid arthritis (Niller et al 2008), chronic fatigue (Hickie et al 2006) and obesity (Wigham et al 2006) are attributed to germs. Even psychiatric diseases are linked to infections like toxoplasmosis (Brown et al 2005), Lyme disease or a simple flu (Ginsburg 2004). And all this might have negative influences onto following generations (learning IV), might contribute to chronic diseases in the offspring (chap. 5.5). Moreover, the 'viral genome' is able to do a lot of harm. Under certain conditions, e.g., through an infection with a wild virus or through severe mental stress these viral genes start to produce molecules that are considered as foreign by the immune system, what might eventually lead to an autoimmune disease (Furlow 2000).

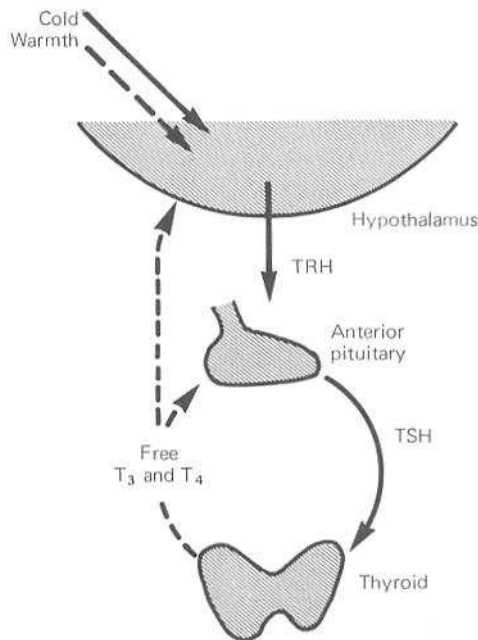
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This analysis shows that the reaction of the immune system is absolutely nontrivial. Germs might be helpful or harmful (hygiene hypothesis vs. germ theory). They might be harmful when perceived on the level of learning I and helpful on another level or



tend to start with ventilation about the same time producing more temperature fluctuations, whereas temperature in genetically diverse colonies is more stable (Jones et al 2004), something that can be seen as an advantage of biodiversity.

Most, if not all, physiological and biochemical process are integrated in several



cybernetic cycles, as seen here with the regulation of the thyroid gland.

The cybernetic model soon attracted the attention of the *Mental Research Institute* in Palo Alto. The researchers found that also behaviour can be described in this terms (Haley 1963).

An example for a cybernetic cycle in the human behaviour is the noise at meals. Each meal has its own set point. (in the family circle, with friends, at marriages, at obsequies).

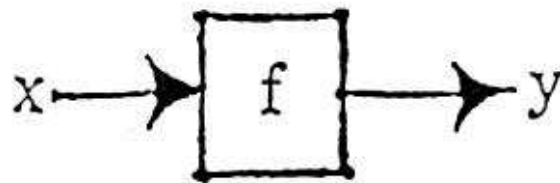
If it is too silent someone will take the initiative to talk and if it is too loud, someone will be active to calm everything down (verbally or nonverbally). At first, it does not matter who starts and what is talked about. Important is that the set point is attained. Of course, these set points are different in different cultures. The film *My big fat Greek wedding* shows the tremendous difference between an extended Greek tribal-family and an American WASP nuclear family.

This rather simple example reveals already a lot of important characteristics of a 'complex adaptive system' (chap. 2.8) which are likewise found in physiological and biochemical processes. For example, these systems are nonlinear, unpredictable, have a distributed control, show equifinality and goal-orientation. In terms of information theory it is also interesting that a cybernetic system in equilibrium doesn't seem to be active. Only in the case of an imbalance signals are sent, at least in this simple model.

## 4.5 Trivial and Non-trivial Machines

The term of a trivial and non-trivial machine became widely known through Heinz von Foerster. The idea is founded on reflections of Alan Turing who had been working on '*finite state machines*'. The term 'machine', introduced by Turing, means a set of rules and laws how a certain state is transformed into a different state (von Foerster 1993: 135).

A trivial machine has a simple mechanism: A certain operation ( $f$ ) is done with an operand ( $x$ ). The result is ( $y$ ).



Because ( $f$ ) is determined, the result is determined and predictable (von Foerster/Poerksen: 57). If we insert a coin in a chewing gum machine, we get a chewing gum, not one time a peppermint, another time a sandwich or a condom. If we type a letter on the keyboard of our PC the letter appears on our screen.

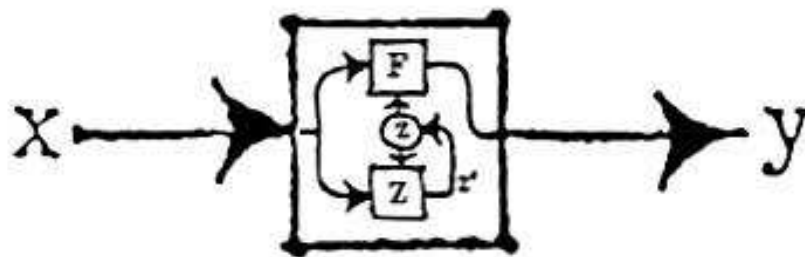
Trivial machines are

- synthetically deterministic,
- analytically determinable; when we know  $x$  and  $y$  we can reconstruct the operator  $f$ ,
- history independent, i. e. every following operation is according to the operation before,
- predictable.

Examples for trivial processes are, according to von Foerster:

input	operation	output
independent variable	function	dependent variable
cause	law of nature	effect
minor premise	major premise	conclusion
stimulus	central nervous system	response
motivation	character	deeds
goal	system	action
....	....	....

Non-trivial machines are quite different. Corresponding to an internal logic the operator changes with every operation (von Foerster/Poerksen, 1999: 58). If each time we type a letter the PC would change its kind of reaction – the first time one key up and two right, the next time two up and four left or so - we would only know what happens typing the letter k, if we know the principles and would have followed the program from the beginning. If we miss even one step the reaction of the PC becomes unpredictable, independent of whether we know the principle of the program or not.



The difference between a trivial and a non-trivial machine is the difference between a chewing gum machine and an one armed bandit.

As soon as three cybernetic circles are interrelated we have technically a non-trivial machine.

The idea of non-trivial machines is not widely accepted, as the normal reductionist approach investigates trivial machines. That is, the frame of observation is set such that only reliable and trivial results arise (chap. 2.1.a). But probably more often than not the human physiology works as a non-trivial machine. Already simple neuronal structures, such as the feeding network of the mollusc *Aplysia* shows a history dependent behaviour during repetitive stimulation (Proekt et al 2004).

#### 4.6 Second-order Cybernetics in Medicine

The influence of the observer onto the observed is a well-known topic in physics. This effect is much more prominent in medicine, although there is little awareness of this fact. The so-called *second-order cybernetics* investigates this interaction between the observer and the observed.

Von Foerster defined first-order cybernetics as “*the cybernetics of observed systems*” and second-order cybernetics as “*the cybernetics of observing systems*” (von Foerster 1995: 1). That is, the observer is also integrated in a cybernetic system and his



knowledge gained by observing is not objective but a subjective construction based on cognitive and social processes. This is a break with the traditional idea that there is an objective organization or structure that can be definitely investigated (Bunge 1979: 203-209). In its final consequence facts are no objective findings but only subjective perceptions (Simon 1993: 151-156). Findings are a 'construction' or even an 'intervention' (von Foerster/Bröcker 2002).

A first-order or decidable question would be whether or not there are reference values for serum iron, how the thyroid gland is regulated, how a transplantation is best done, what virus brings on SARS.

Second-order cybernetics in medicine investigates how the observer creates a situation that leads to certain results. The self fulfilling prophecies belong into this category, or the placebo effect. Second-order cybernetics also analyses the pattern how phenomena are defined as 'ill' or as 'healthy' (Simon, 1995: 12) and on which basis a therapeutic strategy is chosen.

The idea that diseases are invented makes normally no sense in the medical context or only in these cases where diseases are created for marketing or fame purposes. An outstanding example was the in German born 'Sissi syndrome', introduced by then SmithKlineBeecham 1998. Patients – it was the estimation that up to three millions suffered from this syndrome – were said to be severely depressed thus needing antidepressant therapy. The only problem was that *Sissi syndrome* patients do not admit their depression, but cover it by being very active and optimistic. According to the resonance in the media it must have been a good business for the company. It lasted five years until the swindle was discovered. (Blech 2003: 15). The same syndrome was discussed for the Anglo-Saxon world under the name 'Princess Di syndrome' but did not make it at the end (Tuffs 2003).

When the inventions are not so obvious they are called '*disease mongering*'. It "is the selling of sickness that widens the boundaries of illness and grows the markets for those who sell and deliver treatments". But it is not limited to drug companies but involves "alliances of pharmaceutical corporations, public relations companies, doctors' groups, and patient advocates (to) promote these ideas to the public and policymakers—often using mass media to push a certain view of a particular health problem" (Moynihan/Henry 2006). Classical examples are the quite new female dysfunction (Lewis 2005) and male sexuality erectile dysfunction which was redefined by drug companies (Lexchin 2006) leading to a medicalisation of sexual life

(Tiefer 2006). Rather controversially discussed is the fibromyalgie syndrome. Drug companies, drug related physicians and suffering patients maintain that the syndrome 'exists' whereas scientists tend to negate its existence as an independent disease (Berenson 2008a). Many others, often socially not so important diseases are mongered such as the pseudobulbar effect, an uncontrolled laughing in neurological disease (Spiegel online 2005) or the restless leg syndrome (Woloshin/Shwartz 2006). A second order analysis is not concerned with the question whether or not such diseases 'exist'. Existence is no issue in this line of reasoning as everything is regarded as more or less invented. More interesting are the implications and the mechanisms which maintain the idea of an existence, the way how conclusions are taken, the interplay of different factors like technique, interest and theory. Does attention deficit hyperactive disorder (ADHD) exist? According to the current logic yes, as there are hyperactive children, certain criteria, an ICD-10 key (chap. 2.1.e) and the agreement of the medical community. This existence leads to an inappropriate medicalisation of educational performance involving the teachers (Phillips 2006). About 4 million children are treated in the US and may be another million illegally (Aldhous 2006). That is, the borders between real concern, the invention of criteria and mongering is somehow fluent.

The attempts to oppose mongering (Heath 2006, Mintzes 2006) and/or the medicalisation of medicine represent a typical negative feedback loop. They are an essential part of the cybernetics of the observing system in medicine.

The following examples aim to show how 'medical knowledge' is created. They shall demonstrate the inherent mechanisms, tendencies, logical structures. The details are not as important, nor whether certain statements are finally true or not.

### **a) Therapeutic relationship**

It is difficult to describe the psychotherapeutic relationship, even if it is as standardized as the psychoanalytic setting. For example, it might be investigated from the point of view of power. Many authors analysed the power aspect of the therapeutical communication (Milgram 1975, Krippendorff 1995). Some see herein even the main source of the therapeutic interaction (Haley 1963). "Power is a powerful idea"(Cecchin et al 2005). Conclusively, it is a legitimate and interesting task to analyse, how therapists use their power. One investigation taped the first session of therapies and showed how therapists imply their system onto the clients,

how they bind them. That is, what kind of communicative power they have to define the relationship (Bartesaghi 2002).

Such results are not only true for the psychotherapeutic relationship but also for every contact between a doctor and a patient. Power games may influence medical practice more than scientific results. Here comes the 'Sissi syndrome' into the play again. It might become a tool in the struggle between the doctor and the patient. The doctor might use it to get a patient ill, even if s/he does not feel so. The patient might use it, even if the doctor finds no special disturbance. ("Haven't you read of the newly discovered Sissi syndrome?").

But does power describe *the whole* truth? Or even *a* truth?

Feminism, e. g., investigated the intersexual relations mainly in terms of power. The results were often surprising, impressing or even shocking. But most people felt that this description is not the reality they live in.

Research produces only the results foreseen by the used instrument. Investigations of power provide power structures of a situation. Measurements with a thermometer only provide a result in temperature probably in C°, F° or K°. This does not change, even if the measurements are made with greater precision.

This is, indeed, true for every angle of observation. But there are angles that are socially accepted and others are not. It is accepted to describe every disease by its physiology whereas it is not so accepted to describe it by its social context (Simon 1995: 104-110), by power structure, financial interest (what is changing lately) or even by its religious meaning. Even the simple systemic approach to see a symptom or a disease as a means to stabilize a situation is beyond the current understanding. All these aspects cannot be 'seen' with a (standardized) physiological description. But "it is an important trend of the development of science that new aspects, previously unnoticed, are 'seen', i.e., come under the focus of attention and appreciation; and conversely, an important obstacle that the goggles of a certain theoretical conception do not allow to realize phenomena which, in themselves, are perfectly obvious. History of science is rich in examples of such kind" (Bertalanffy 1968: 237).

## **b) Neuroscience**

Neuroscience finds neurophysiological results. These results are as restricted as any other way of observing human nature. They are mainly instrument bound. The

following examples of research in neuroscience are chosen because they are vivid and sometimes humouristic. Simultaneously they represent a general attitude.

“New brain scanning studies have shown, that when you first fall in love, you are not experiencing an emotion, but a motivation or drive ... The early stages of a romantic relationship spark activity in dopamine-rich brain regions associated with motivation and reward. The more intense the relationship is, the greater the activity. The regions associated with emotion, such as the insular cortex and parts of the anterior cingulate cortex, are not activated until the more mature phases of a relationship... There are some differences between love-struck men and women... Women in love show more emotional activity earlier on in a relationship. They also seem to quiz their memory regions as they look at pictures of their partner, perhaps paying more attention to their past experience with them. For men, perhaps unsurprisingly, love looks a little more like lust, with extra activity in visual areas that mediate sexual arousal” (Phillips 2003d).

This result may not be valid as it was found in 7 male and 10 female volunteers. However, it shows some remarkable characteristics. First, the research does not provide new discoveries of human behaviour, as the kind of reaction is known to us. The scientists might only claim that they proved every-day knowledge, because they measured it. What the paper solved, however, is a problem that puzzled humans since thousands of years: “What is an emotion?” It is an activity of the insular cortex and parts of the anterior cingulate cortex. This answer is the answer of a method, better: of a machine. Many emotional processes can be mapped in such a way (Fisher 2004). A study answered the question “Does rejection hurt?” (Eisenberger et al 2003) with “yes”, as the same neuronal areas were active as in physical pain.

Such results do not create a new reality. They are, at first, but simple descriptions in a certain context. The next step would be to conclude that everything not in line with this definition is no love or pain, the *metaphysical shift from description to prescription*.

An example is the case of a women with an acute, bilateral occipital artery infarction with occipital lobe damage, leading to a *Charcot-Wilbrand syndrome*. As a result she lost her ability to dream. The claim that dreams are generated in the destroyed part of the brain is only a hypothesis to be proved, in the first place. But the conclusion that Freud’s concepts are wrong, because if dreams would have any meaning they would have been generated in the frontal lobe (Bischof/Bassetti 2004) is a typical fallacy through the metaphysical shift.

In fact, there is a lot room for fallacies. The reductionist context suggests a trivial correlation between a tested behaviour and the reactions in the brain. But things are far from being as simple. The same regions of the brain are active in romantic and maternal love (Bartels/Zeki 2004). However, they are also active in hate (Zeki/Romaya 2008). The difference between love and hate can be found (if the results are reliable) in the activity of other centres which are simultaneously active (Kawabate/Zeki 2008). That is, such emotions are a result of an interplay of factors, an emergent phenomenon (chap. 4.10), where a small change of the pattern might lead to a totally different outcome.

This can be demonstrated with other results of brain research. Different observers of a Western with Clint Eastwood showed the same activation pattern of the brain. The conclusion of the authors was that they see the same (Hasson et al 2004). Other studies show, however, that the hormonal response between men and women differs considerably, especially in seeing an action film (Schultheiss et al 2004). That is, they react differently seeing the same.

Again, we find that extremely difficult issues like 'sameness', 'perception' and 'seeing' have been defined in a way convenient for the machine. But we have really no idea in how far different genders and different persons 'perceiving the same' really perceive the 'same' and how 'same' it is. The look at the brain scan is not possibly not enough to judge.

Men, according to common opinion, are more interested and responsive to visual sexual stimuli. That can be measured by the amygdala response to certain sexual stimuli. Therefore, it was no surprise that the amygdala of men showed a stronger activation than women's amygdala. However, women reported greater arousal (Hamann et al 2004). What does it mean when in men and women confronted with erotic images the brainwave activity is the same (Anokhin et al 2006)?

Another problem with brain scan shall be demonstrated with a presentation at the Congress of the American Society of Neuroscience 2003. Holstege found that the female orgasm is characterized by an activity of the ventral tegementum (VTA) whereas the faked orgasm showed activity in different areas of the brain mainly responsible for motion. This is in so far meaningful as cats with destroyed VTA area lose their desire to mate. But PET scanning is bound to technical restrictions and the test persons had to lie without moving and had to reach orgasm within 40 seconds by genital stimulation (Simm 2003).

This might be seen as an extreme example from a moral point of view. Nevertheless, it is scientific according to the generally accepted criterion that it might be falsified (Popper 1972). It would be possible – as even caged animals have different sensory maps than under naturalistic conditions (Polley et al 2004) - to falsify the findings of brain scanning, showing, e.g. that other areas of the brain are active in pain, love or sex.

The problem arises when we go a little further and investigate the polycontextural pattern.

The ventral tegentum (VTA), active in orgasm, is also highly activated through injections of heroine. Consequently addicts often compare being high with an orgasm (Simm 2003). Other centres of the brain have other drugs. The nucleus acumbeus – a main centre of humour and laughing – is triggered by cocaine (Mobbs et al. 2003).

What is the next step after finding such relations? The measurements of the nucleus acumbeus “could help to diagnose the early stages of depression - or show whether antidepressants are taking effect - during which people’s appreciation of humour is altered. ‘That would be a terrific way to use this type of work’” (Pearson 2003).

We have here in a nutshell the principles of a medical paradigm: to diagnose depression by the reduced activity of a humour centre in the brain and to treat it with a cocaine like drug.

According to this logic, an effective therapy fulfils the criteria of the American Psychiatric Association for drug addiction (Camí/Farré 2003). That is, drug treatment becomes in line with drug addiction. Whereas the therapy for addicts aims to normalize the brain in a self regulative way (Goldman/Barr 2002), the machine based approach seems to facilitate addiction. Thus it is to no one’s surprise that addiction to prescribed drugs became a major problem in Western society. An official estimate says that about 1.4 – 1.9 million people in Germany became addicted to some kind of pharmacological drugs after treatments (Bätzing 2006) and more people die from legal drugs than from illegal (Statistisches Bundesamt 2008). This number does not included people who are lifelong treated for symptoms and diseases where an unspecific or natural therapy would be possible.

In a climate where every unease or disease is treated with a drug (which might be highly effective in a certain frame of observation), it is not astonishing that already adolescents have a high consumption of cannabis and hard drugs (Leurs et al 2004,

Bellis et al 2008). A society which treats everything with drugs has, of course, a drug problem. And it sounds like an irony that even addiction shall now be treated with drugs (Thyer 2006).

A second-order analysis has to provide such insights like how the observer (in using a machine) comes to certain results (definition of love, orgasm, humour and depression), and how these results might lead to a certain therapy (similar to drug addiction). Other ways of perceiving medical process come to other definitions leading to other therapies with other medical and social impacts. For example if depression would be seen mainly as a social phenomenon, its therapy would be totally different.

### **c) Osteoporosis**

A more practical example is osteoporosis. The term, “literally ‘bone porosity’, designates a deficiency of bone tissue per unit of bone as organ” (Beeson/McDermot 1975: 1826). It is one of the most expensive diseases in our time. There has been a sharp increase of osteoporosis in the Western world from 1950-1980 with a clear difference between city and countryside and between different countries (Cummings/ Melton 2002). Concerning its causes, epidemiological data are quite confusing and all sorts of theories prevail. Of course, there is a genetic theory (the 20p12 gene and the BMP2 gene might play a role) but the findings are not very convincing (Styrkasrdottir et al 2003).

Some decades ago osteoporosis was a diagnosis of an advanced situation because it only could be diagnosed through fractures or x-ray, which is altered only if the bone has lost a lot of its density. This situation changed with x-ray absorptiometry which is able to provide more general data on bone mineral density (BMD). Through its introduction osteoporosis became a widespread disease. The diagnosis depends mainly on the measurement as there are no satisfactory clinical means to assess bone quality (Kanis 2002).

The diagnosis of osteoporosis is established according to WHO principles modified by the International Osteoporosis Foundation (Kanis 2002). Its basis is the so-called SD score. The SD score expresses bone density values of individuals in relation to a reference population in standard deviation (SD). The current classification is:

- *Normal*: hip BMD greater than 1 SD below the young adult female reference mean
- *Low bone mass* (osteopenia): hip BMD greater than 1 SD below the young adult female mean, but less than 1 SD below this value
- *Osteoporosis*: hip BMD 2.5 SD or more below the young adult female mean
- *Severe osteoporosis* (established osteoporosis): hip BMD 2.5 SD or more below the young adult mean in the presence of one or more fragility fractures.

But bone density measurement is not sufficient to assess bone quality (Seeman/Delmas 2006) or to preview fractures accurately (Jeras 1999). This is why there is a lot of discussion concerning this diagnosis and many prefer to talk about fracture risk.

This leads to a confusing situation: the measurement does not lead to a suitable diagnosis and what is discussed about has often little to do with the diagnosis and the measurement. A look at the risk factors for osteoporotic fractures shows why:

*Female sex, primary or secondary amenorrhoea, primary or secondary hypogonadism in men, Asian or white origin, previous fragility fracture, low bone mineral density, glucocorticoid therapy, high bone turnover, family history of hip fracture, poor visual acuity, low bodyweight, neuromuscular disorders, cigarette smoking, excessive alcohol consumption, long-term immobilisation, low dietary calcium intake, Vitamin D deficiency* (Kanis 2002).

Another one is:

*Age, history of maternal hip fracture, increase in weight since age of 25 years, height at age 25 years, self related health, previous hyperthyroidism, current use of long acting benzodiazepines, anticonvulsant drugs, caffeine intake, walking exercise, inability from rising from a chair, perception, resting pulse rate, any fracture since age of 50 years, calcarean bone density* (Cummings/Melton 2002).

Thus, osteoporosis turns out to be only one of many risk factors for fractures and the tendency to suffer fractures could be seen as a life style problem, as well (Keen 1999).

Pathophysiologically, osteoporosis is an imbalance between osteoblasts and osteoclasts, where even the brain function plays a role (Hebrew University 2005).

Osteoporosis is a network pathology (chap. 6.2, 6.7) with a rigid regulation of bone metabolism (Gerok 1989). But reductionist science investigates often only one of the components, for example, the osteoblasts (Ducy et al 2000) or the osteoclasts



(Teitelbaum 2000). And treatment tries often to fix one of these components. This lead to two major setbacks in the history of the disease.

1) Around 1980 - 1990 the standard therapy was sodium fluoride (NaF). It was known that NaF stimulates osteoblasts to produce more bone mass, thus improving BMD. Every week we (as GPs) received a new (mainly industry sponsored) study, proving the effectiveness of this therapy. After some years an independent study showed that, in fact, bone mass was higher but as well the incidences of extra vertebral fractures (Riggs et al 1990). Through the therapy bone mass had increased, but the bone became more brittle. NaF is not used anymore. This is a typical example how the treatment of a surrogate parameter leads to a decline of health.

2) Later, to prevent the post menopausal decline of BMD, hormone replacement therapy (HRT) was widely used. The results were again favourable. Even the largest study (WHI study) proved a decrease in hip fractures (5/10 000). However, these women had a quite greater risk for heart attacks (7/10 000), stroke (8/10 000), breast cancer (8/10 000) and thrombosis (18/10 000) (Wassertheil-Smoller et al 2003).

The current treatment of osteoporosis is bisphosphonate. There are first indications that the therapy might lead to an increase of osteonecrosis (Rizzoli 2008) and atrial fibrillation (Group Health Cooperative Centre for Health Studies 2008). Although there is no sharp rise of this complication, nobody knows what will happen when millions of women take the drug for decades.

Given all that, the question of the appropriate therapy is difficult to decide on. To prevent hip-fractures (what is the main aim) many strategies are possible. As falling is the central cause (Oliver et al 2005), so called hip-protectors have been found to be helpful (Meyer et al 2003), but are controversially discussed (Parker et al 2006). Good sight is also essential to avoid falling. This would improve the situation without even touching any mechanism of osteoporosis.

Prevention of osteoporosis and/or fractures is possible in many other ways: exercise, nutrition, restriction of drugs and stimulants etc (Platen 1997). Especially exercise is effective (Kemmler et al 2004).

As also serotonin fosters bone formation (Kolata 2008) and even the autonomous nervous system influences (via leptin) the remodelling of the bone (Elefteriou et al 2005), it is evident that bone density and quality is very much an expression of the general condition of the human and less a local problem. That implies that also

general methods of relaxation and well-being might be effective in the prevention of osteoporosis and fractures.

Looking at all these possibilities it is not intelligible why mainly drug therapy is discussed in the medical discourse. Or better: it is only intelligible when a machine based diagnose and a drug based intervention is taken as general guideline for medical treatment.

What creates such a kind of perception and action? What maintains it? These are important questions in a second-order analysis. It is not necessary to solve them. This is a first order thought. Second order cybernetics has to provide the necessary tools to improve the understanding of such interactions, what, eventually, might result in an increase of choices.

## 4.7 Systems Theory

Systemic concepts are slowly on advance in basic research (European Science Foundation 2007). Also *Science*, *Nature* and other important scientific magazine address the subject of 'systemic biology' ever more. Scientists understand that linear concepts will not solve their problems as they are confronted with an exponential growth of data (Pennisi 2003). Variables are so numerous that it became somehow difficult to reproduce experiments in the 'same way' (Szalay/Gray 2006) – a crucial precondition for a reductionist research. Reductionism in its old sense seems no longer to be possible. "Biology today is at a crossroads. The molecular paradigm, which so successfully guided the discipline throughout most of the 20th century, is no longer a reliable guide. Its vision of biology now realized, the molecular paradigm has run its course. Biology, therefore, has a choice to make, between the comfortable path of continuing to follow molecular biology's lead or the more invigorating one of seeking a new and inspiring vision of the living world, one that addresses the major problems in biology that 20th century biology, molecular biology, could not handle and, so, avoided. The former course, though highly productive, is certain to turn biology into an engineering discipline. The latter holds the promise of making biology an even more fundamental science, one that, along with physics, probes and defines the nature of reality. This is a choice between a biology that solely does society's bidding and a biology that is society's teacher" (Woese 2004).

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Ever more scientists try to adopt the concepts of systems science. But this turns out to be rather difficult, especially in the sciences of the living. Systemic biology became “a mutated soup of artificial life, computational biology and computational chemistry with a biz of mathematics, physics and computer science thrown in. Because it is so broad and has few recognized boundaries and plenty of funding, it is attractive to anyone who has ever thought about life and has some relevant technical expertise” (Werner 2007).

General Systems Theory (GST) has been called a ‘dynamic field’ (Jackson et al 2000a). This is a nice way to say that GST is chaotically interdisciplinary. Systems conferences are characterized by an extreme methodological pluralism (Jackson et al 2000a: 28). Although “Systems Science try to find homomorphism among different phenomena or objects, using a more abstract language that would enable the description of homologous phenomena and the unification of science and other disciplines” (Paritsis, 2000a: 55), GST has difficulties to define its paradigm, if there is any. A major problem is even to define what a system is. There are a lot of definitions, but no one seems really to satisfy strict critics (Guberman 2002).

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One definition of systems talks of the scientific exploration of ‘wholes’ (Bertalanffy 1968: xx), or of a science of ‘wholeness’” (Bertalanffy: 37). However, this word has been well misused in medicine. It is connected to the unbearable concept of a ‘holistic medicine’ where nobody knows what this might mean. ‘Holistic therapists’ claim to treat the whole person. In my reading this is always true, because always a whole person is treated. But some find it more holistic to talk about family problems than about the gall bladder. On the other side there is no holism as every approach concentrates on a certain field of observation. E. g. computer-tomography of the whole person, coming into fashion in America (Illes et al 2004), is – in a certain way – holistic, but this is probably not meant with wholeness.

Sometimes it is said that “the whole is more than the sum of parts” (Bertalanffy: 55). But may be it is more correct to say that the whole is something different from its parts (von Foerster 1976).

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There have been definitions like “complexes of elements standing in interaction” (Bertalanffy: 33), or “systems of elements in mutual interaction” (Bertalanffy: 45), or “a set of members, of their properties, of their relations and of the emerging

properties of the system” (Paritsis 2000b: 178). But such expressions are quite vague. Of course there have been more refined attempts to define systems:

- A system is an organized assembly of components – there exist special relationships between the components.
- The system exhibits behaviour unique to the system.
- Each component contributes towards the behaviour of the system and is affected by being in the system. No component has an independent affect on the system. The behaviour of the system is changed if any component is removed or leaves.
- Groups of components within the system may themselves have properties, that is they may form subsystems.
- The system has an ‘outside’, an environment, which provides inputs to, and receives outputs from the system. The system is separated from the environment by the boundary.
- The system has been identified by someone as being of special interest.

(Daellenbach cited by Jackson et al 2000a: 17)

It seems that a system is what an author likes to be a system. In a discussion von Foerster was asked whether a table could be seen as a system. He answered: “Yes, but it is a boring one” (private communication). I prefer to call GST a *think tank* in the investigation of complex phenomena.

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Medicine is in the advantageous position to have a quite clearly defined system: the human.

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GST was a result of European thinking. It was especially predominant in the German speaking part (Austria and Germany), whereas the Anglo-Saxon world was more concerned with cybernetics. The main representatives of these two different movements were Bertalanffy for GST and Ashby for cybernetics (Bertalanffy: 94). Cybernetics is more analytical, concentrates on control, whereas GST is more concerned with processes and changes. However, cybernetics and GST mingled and today nobody would claim to follow either of them.

The main focus of both, systems theory and cybernetics, is the investigation of organization.

Characteristics as “growth, differentiation, order, dominance, control, competition etc.” cannot be described with analytic methods (Bertalanffy: 47).

GST describes the ‘logic of the process’. It is concerned with the operation, neither with the operator nor with the operand (chap. 4.5).

Descriptions and control of organization have been the domain of physiology from the beginning. But this has been restricted mainly to organs (the heart) and/or simple functions as respiration. In a more complex sense the concept of the *milieu interieur* by Bernard in the 19<sup>th</sup> century, Cannon's (1871-1945) *homeostasis* in the first half of the 20<sup>th</sup> century and later Seyle's *stress theory* were systemic approaches. But it was Bertalanffy (1901-1972) who developed a more general concept with an according algebra, investigating systems in equilibrium. Prigogine (1917 - 2002) further evolved these ideas in investigating systems far from the equilibrium.

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Although systems scientists try to describe the function of systems by algorithms, this becomes more and more difficult as the complexity of the defined system rises. For example, there are quite a lot of mathematical models for the development at the stock markets. But a random model based on chaotic choices shows the best results (Ball 2003). The reason is either that market traders are mindless, or that mathematical models are not able to describe human behaviour adequately. After the events in the first decade of the second millennium the most probable answer is: both is true. In any case, to describe complex systems as the human or the stock markets verbal models are necessary. Pure mathematical models are not enough.

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Strictness and mathematical accuracy is normally found in systems without environment, that is, in system which are two valued and true. But these systems have no meaning (chap. 3.5). Such systems are closed to matter, energy and information. But, „the organism is not a closed, but an open system. We term a system “closed” if no material enters or leaves it; it is called “open” if there is import and export of material.

There is, therefore, a fundamental contrast between chemical equilibria and the metabolizing organisms. The organism is not a static system closed to the outside and always containing the identical components; it is an open system in a (quasi-)steady state, maintained constant in its mass relations in a continuous change of component material and energies, in which material continually enters from, and leaves into, the outside environment” (Bertalanffy: 121).

One possibility to cope with the complexity of the living is the probabilistic, the statistical approach. But as seen before, this does not describe a semantic pattern (chap. 2.1.d). It is no serious solution for complexity.

Complexity was a central issue of cybernetics from its beginning. Pioneering was Ashby's '*law of requisite variety*' (Ashby, 1965: 206-213). It says that in order to control a system and to make it responsive to environmental fluctuations, the controller must command as much variety as the system itself exhibits.

That is, „if a machine has 20 ways of breaking down, we have to respond to 20 different ways to control the machine...If I am a competent photographer, and possess a decent camera, I should possess sufficient variety in terms of distance and exposure to always get my subjects clear. But what if we are faced with systems exhibiting apparently massive variety. How can we cope with this? The answer is that we must either reduce the variety of the system we are confronting (variety reduction) or increase our own variety (variety amplification). The variety of the system confronted must be reduced and/or increased, and this must be done in a way appropriate to the particular system being considered and its goals” (Jackson et al 2000b: 33)

One option is variety reduction. In psychosis for example, variety is reduced by a strict pattern of diagnosis and therapy. That is, the variety of the therapist is reduced. The patient's variety is reduced by space restriction and drug therapy. Some argue that this might contribute to chronification (Podvoll: 61-68, 125-127, 150-152). Although medicine tries to reduce variety, systemic models support that the controller of a system has to increase his own variety in order to reduce the variety of the controlled system. This led to the famous statement: “Only variety can destroy variety” (Ashby, 1965: 207), or von Foerster 'ethical imperative': “Act always so as to increase the number of choices” (von Foerster/Bröcker 2002: 15-16). For medicine this would imply to develop a methodological pluralism which is the main request of this thesis.

GST provides the appropriate methodology to handle variety either in the individual, in a sub-system or in a whole population. Unfortunately more complex systems are rarely investigated with such a proper methodology. Paritsis puts it that way: “The first is that there are many models that are using different methods of description about different or the same processes and systems. The second is that there are few models that are dealing with global properties of intelligent or behavioral systems. The third is that there are even less models for presenting global or general properties for systems that behave, are intelligent and interact with their environment” (Paritsis 2000a: 55)

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Some basic systemic principles are:

Struggle between parts (Bertalanffy: 66): A system consists of parts in interaction.

The principles of a local activity bringing forth patterns and forms of higher organisation is the domain of emergence-research (chap. 4.10) and can be modelled with cellular automata.

Centralisation: Living systems are characterized by an ongoing centralisation (Maturana/Varela 1998). Although the individual parts or compartments might work nearly machine like, they are submitted to an overall regulation. This overall regulation is relatively independent from the initial conditions of its parts (Bertalanffy: 68-69).

Circadian rhythms are produced on a cellular level by clock genes (Gelder et al 2003). They work like trivial machines (chap. 4.5). They are integrated on the level of individual organs such as the heart, the liver or the kidney which have their own circadian rhythm (Yamazaki et al 2000, Storch et al 2002). The organ level is integrated in a time centre in the brain, the hypothalamic suprachiasmatic nucleus which determines physiology and behaviour (Yamaguchi et al 2003). This centre also processes inputs from other parts of the central nervous system, through timing of sleep and wakefulness (Deboer et al 2003), or through light exposure (Iglesia et al 2004). In the forebrain there is another centre producing a circadian rhythm dependent on food intake (Dudley et al 2003). All these different rhythms form the 'biological clock' or better 'circadian temporal program' (Green/Menaker 2003). There seems to be no overall centre to decide. Inner time is an emergent phenomenon of distributed control, as so many biological phenomena. The inner clock arises through a struggle between individual trivial clocks which are centralized. In such centralized systems the prediction of the behaviour of the system is difficult or impossible when only the parts are seen. Small energetical changes on one level might be amplified "causing a considerable change in the total system" (Bertalanffy: 71). But local changes might also have no effect onto the overall behaviour.

Achieving goals/Self-interest (Paritsis 2000a: 56): The prediction of the behaviour of a system is hardly possible by the observation of its parts. It is, however, to a certain extend possible when its propose, its goal is understood. This approach is called *teleological*. Teleological thinking has long been seen as anthropomorphic. But it cannot be avoided when complex phenomena have to be described. Von Foerster demonstrates this with a simple example: It is nearly impossible to find suitable

models and equations to describe all actions of binding a shoelace. But with a teleological phrase (“this is done in order to bind a shoe”) the process is reduced and makes sense (von Foerster/Bröcker 2002: 31). Similar is the situation in biological research. “Gene regulation, intracellular signalling pathways, metabolic networks, developmental programs—the current information deluge is revealing these systems to be so complex that molecular biologists are forced to wrestle with an overtly teleological question: What purpose does all this complexity serve?” (Lander 2004).

Systems theory says that systems try to achieve a goal using its resources in order to do so.

This sounds somehow metaphysical, at first. Nevertheless, teleological concepts are more appropriate to predict the behaviour of complex systems than models where biological processes are just seen as accidental. The developments of the last decades in engineering and social science would have been impossible without teleological thinking, starting in the sixties with the *Macy conferences* (Pisa 2003). We have today the somehow paradox situation that teleological concepts prevail in computer science and engineering, but are rather neglected in the science of the living where they are more than obvious.

Teleological principles in medicine are mainly used in ‘evolutionary medicine’ (chap 6.8) to understand in how far diseases and symptoms are useful for humans and thus represent an evolutionary advantage (Lewin 1993). They are also found in some vitalistic concepts of CAM. Teleology does, for example, not ask how fever is produced by the body but to which purpose (chap 6.8). Such a change of perspective induces necessarily a different perception of medical processes.

Equifinality: Equifinality combines the finding of centralisation with the idea of a teleological behaviour. It says that the behaviour of a system cannot be predicted by its parts *and* that a final state can be approached by different means. “In any closed system, the final state is unequivocally determined by the initial conditions: e.g., the motion in a planetary system where the positions of the planets at a time  $t$  are unequivocally determined by their positions at a time  $t_0$ . Or in a chemical equilibrium, the final concentrations of the reactants naturally depend on the initial concentrations. If either the initial conditions or the process is altered, the final change will also be changed. This is not so in open systems. Here, the same final state may be reached from different initial conditions and in different ways.



This is what is called equifinality, and it has a significant meaning for the phenomena of biological regulation” (Bertalanffy: 40).

This is quite similar to the polycontextural network of Günther (chap. 3.5), where different points in the net can be reached in different ways. Besides that, equifinality also claims that the system has a certain end, a goal, a *τέλος* to be attained. “The behavior of a system is intelligent to the extent that it maximizes the chances for self preservation of that system in a particular environment” (Paritsis 2000a: 72). A simple example from the social field is the question: Why do children play? An analysis shows that playing can promote many tasks like language acquisition, movement development, holding the body in shape, trying out different patterns from riddle solving to mating and so on. But playing is not necessary to achieve any of these aims. All that could be done in a different way and is done in a different way in times of crisis (Henig 2008). But playing is a rather enjoyable way to achieve these ends and fulfils different tasks simultaneously. This is, at least, the teleological assumption.

In neurophysiology it is known that the same results can be achieved in different ways (Sohn et al 2004). For example, after the destruction of parts of the brain other centres are – to a certain extent – able to take over the duties of the destroyed tissue.

Equifinal strategies can also be seen with placebos inducing health in using the same or other signalling pathways as a real drug (chap. 2.4.d). But people might get also rid of a lot of diseases just by exercising regularly (Blech 2007b). That is, the aim of restoring health can be attained in many different ways. Many approaches to health are possible: good nutrition, the right use of rhythms, or psychotherapy, just to name some. Equifinality says that everything might serve as a tool to achieve the aimed goal if there is enough responsiveness and not too many pathways blocked.

## **4.8 Autopoiesis**

In order to apply systemic concepts, the system has to be defined, in the first place. The whole living being suggests itself by nature, as every subsystem (circulation, neurological organization or immune reaction) depends on the integrity of the whole. The behaviour of such a whole differs in certain regards from the behaviour of its subsystems. This is a logical consequence of centralisation and equifinality.

May be the best model to understand the singularity of a living ‘whole’ is the concept of an *autopoietic unit* introduced by Maturana and Varela in their book *The tree of knowledge*, first published in 1987. A similar, but less precise model is discussed today under the header of robustness and evolvability (chap. 6.4).

According to Maturana and Varela the main principles of living systems are:

- structural determination,
- self-referential organisation,
- operational closure.

“All systems are structure determined, that is, they operate according to their own structure in any instant. This is the case for planetary systems, for weather, for tape recorders - any system; the operation of a system depends on its structure. This is also the case with living systems. The peculiarity of living systems is that their operational dynamics conserve living. Living systems are discrete entities that are constituted as such through their molecular dynamics; they are molecular systems that continually produce themselves “

(Maturana/Bunnell 2001a). The difference between the living and the automata is, according to Maturana and Varela the self-reproduction on a molecular level. “A living system is a network of molecules that interact with each other in such a way that through their interactions they produce the same kinds of molecules as the network that produced them—and in doing so, constitute the whole network as a singular unity” (Maturana/Bunnell 2001a).

“Autopoiesis is not a way of saying “self organized”, nor does it imply that any system that is spontaneously organized or maintains its organization is autopoietic. All systems appear as spontaneously organized when the relationships that comprise the organization of that system begin to be conserved. Further, many systems are homeostatic or resilient. Living systems are unique in the sense that the network of molecular productions, which makes them a living system is the same network that produces itself – something that is only possible in the domain of molecular dynamic” (Maturana/Bunnell 2001a).

*This model defines the reconstruction of the own structure and organisation as the central characteristic for living beings and implies a ‘downward causation’ as the necessary means to do so.* This far from being a trivial statement. It informs us about a certain hierarchy inherent in biological processes (chap. 6.12) and might suggest therapeutic strategies, as well (chap. 6.13).

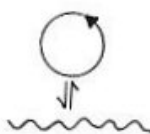
This autopoietic unit exists in interaction with the environment. “Living systems exist as autonomous unities that realize their living through interacting with part of

their environment in a manner that provides the necessary flow of energy and materials. This is true for a bacterium, a rose, a bear, or a human being” (Maturana/Bunnell 2001b).

“For example, the process of molecular productions that constitutes a living system cannot exist in isolation, it is only possible with a flow of matter and energy. Thus living systems can only exist by interacting with a medium that provides matter and energy. Living systems can only exist in a context, which provides them with a flow of matter and energy. Realizing this, we can be aware that organizations also only survive in a flow of matter and energy” (Maturana/Bunnell 2001a).

The molecular flow of energy and material can best be studied in the field of digestion which mainly takes place in the intestine. Food has to be broken down into molecular components in order to be absorbed. In the intestines the relation between me and other is somehow fluent (chap. 2.8.b).

The constant recursive exchange of the autopoietic unit includes other units. This is called *structural coupling*. The concept of *co-evolution* is such an example of a coupled development (Gilmore/Ferretti 2003). E.g., the propensity to carry non-pathogenic E. coli is a heritable trait (Ruby et al 2004). Also lactose-tolerance developed together with cattle farming (Beja-Pereira et al 2003). That is, inner structure and organization do not developed accidentally but according to the environmental conditions. Consequently, the genetic expressions seems to be altered more in the host when it comes to the host - parasite interaction (Nuismer/Otto 2005). In an autopoietic system principles of life are conserved. It acts and reacts according to its inner structure. Confronted with a changing environment it has to balance these changes or the autopoietic unit cesses to exist. Such changes might induce a change of the inner structure representing a form of higher learning (chap. 4.3). Logically the environment does not constrain or determine the processes of the unit. The environment provides *perturbations* which trigger the inner behaviour of the unit. The autopoietic model has been regarded as a major development in the study of living processes. But it is nothing different than Bernard’s concepts of an inner environment. “Vital phenomena are the result of contact between the organic units of the body with the *inner physiological environment*” (Bernard: 76). Even the symbol of Maturana and Varela to depict the autopoietic unit (illustration)



is in line with Bernard's thinking: "In complex organisms the organism of life actually forms a closed circle" (Bernard: 88).

\*

This model has several not unimportant implications for the medical theory and practice. It has been demonstrated logically before that it is impossible to treat diseases (chap. 3.4). The autopoietic model gives a more detailed physiological explanation for this claim. Every therapeutical intervention is nothing else than a perturbation, a stimulus changing the inner regulation and structure (chap. 6.10). Although the concept of the physician might be different, on the level of biological 'reality' every kind of therapeutic intervention leads to a change of the inner regulation of the treated representing a certain type of learning.

The following section shall demonstrate certain consequences resulting from the organisational closure of the living using the examples of

- the neurophysiological sub-system,
- the biochemical sub-system,
- the visce-neuro-muscular sub-system.

#### **a) neurophysiology and the funnel of Nuremberg**

The function of the sensory nervous system is the classical example for a structure-determined system. Already in the first half of the 19<sup>th</sup> century, Johannes Müller described that sensory nerves do not 'perceive' anything. They just send an undifferentiated signal to the brain. The sensory impression is constructed out of the impulses which only differ in their frequency. Müller stated: "Some have come to the realization that a sensory nerve is not a mere passive conductor, but that inherent in each particular sensory nerve are also certain special energies or qualities that are merely stimulated and brought out by exciting causes. Therefore, sensation is not the conduction of a quality or state of external bodies to consciousness, but the conduction of a quality or a state of nerves to consciousness, excited by an external cause" (cited in Foerster/Bröcker 2002: 36). The nerve does not provide any qualitative information. The nerve *is*, out of its structure, the qualitative information.

In their influential article *What the frog's eye tells to the frog's brain* (Lettvin et al 1959) Maturana and McCulloch revived these thoughts. They demonstrated that perception, in a more general sense, depends on the structure of the nervous system and does not depict an outer reality. That is, perception is a structurally determined

reaction to environmental perturbations.<sup>12</sup> Such findings influenced the theory of cognition, learning and artificial intelligence. *Radical Constructivism* developed these ideas further and investigated a lot of their consequences (Glaserfeld 1995). For pedagogics, for example, it became clear that it is impossible to teach. Knowledge can't be poured into the brain of a pupil as with *Nürnberger Trichter* (funnel of Nuremberg). It is as impossible as to bring a steak into a person without digesting it. In teaching only the inner structure can be perturbed (Thissen 1997).



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### **b) the biochemical system and the lesson of psychoactive drugs**

A very similar organisational closure is seen in the biochemical system. When Pert first discovered the opiate receptor in 1972 this was a landmark in the understanding of the human function. Just as the nerves do not transport any quality, the cell does not receive any qualitative signal. *The receptor is the quality*. Every physiological process everywhere in the body is mediated by such receptors and the condition and reaction of a cell is determined by the equipment and the function of its receptors. Receptors are not stable. Their function is nonlinear and history dependent (Pert 1999). They are non-trivial machines (chap. 4.5). Even the manipulation of a single receptor might lead to a divergent behaviour of the whole organism (Daniels et al 2005). The consequence is that the linear models are not able to provide enough information to understand the actual effect of a therapy. This shall be demonstrated with a dark chapter from the history of medicine.

Benzodiazepine was once widely used, as it provided many beneficial effects in the reductionist research. Its story reads like this (Shooter 2003):

- First introduced to the United Kingdom in the 1960s as a “safe” alternative to barbiturate
- Used as a panacea for anxiety—in everything from wrecked marriages to redundancy
- 31 million NHS prescriptions per year at the height of their popularity, enough to sedate three out of every four adults in the land

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<sup>12</sup> Of course, there is an ongoing discussion in how far neuronal impulses represent an outer reality (Paritsis/Stewart 1983). This ontological question is not further discussed here, as it has, for the moment, no impact for the physician's work. First the basic findings of a structural and operational closure have to be translated into medical thinking before more detailed questions of their consequences can be understood and discussed.

- Experts voicing warnings about addiction and side effects by the early 1970s. Fought by drug companies and ignored by doctors
- Not until 1988 that the Committee on Safety of Medicines took decisive action. Users banded together to demand compensation
- Despite all this, 16 million prescriptions per year still being written in the late 1990s and 25-30 000 “benzo-babies” born every year to women using them
- Withdrawal said to be more difficult than from heroin. Over 200 side effects have been reported. Why were the warnings unheeded for so long?

What has gone wrong in this and in many similar cases? Was it only the financial interest of companies and the carelessness of the physicians and politicians? No.

There is something more essential in it.

Benzodiazepines do not treat certain more or less clearly defined diseases or conditions according to signalling pathways found in reductionist research. They perturb the inner structure of the autopoietic unit ‘human’ on different levels using the receptors of the cells.

The so-called ‘valium receptor’ was not made by nature for valium to work (Pert 2001). Or more generally spoken: when a drug works, there has to be a receptor for it and this receptor has a meaning in the inner organisation.

An analysis of the effect of psychoactive drugs provides a better understanding of this essential process. All kind of psychoactive substances work only, because the organism itself produces similar compounds. Cannabis-like substances (endocannabinoids) seem to limit psychotic experience and depression (Nowak 2004), play a role in stress-related situations (Di et al 2005), in immune response (Karasek et al 2007) and have a lot of other hormone like functions (Pagotto et al 2006). Harmine-like compounds are ubiquitous in our body resembling dimethyltryptamine (DMT), a psychoactive drug producing schizophrenia like states. The drug has also an antidepressive effect (Melton 2004).

As a matter of fact, psychoactive drugs resemble spontaneous inner conditions and are able to create pictures like schizophrenia or bipolar disease (Podvoll 1990, Heimann 1990). “The key difference between morphine, heroine, and your own internal drugs is that it’s real hard to get rid of morphine or heroine once you have a shot of it. The only way it gets broken down is in your liver, and that takes hours and hours. In contrast, what the endorphins and all of these different peptides do is: they flicker” (Pert 2001). That is, schizophrenia, bipolar diseases and altered states as in cannabis or LSD consumption are normal physiological states. Their only problem is their duration. They should last only for a very short time.

The repeated use of drugs might lead to an adaptation. Adaptation in this case means the reaction of the organism when forced to remain in this state for longer than intended by the inner regulation. It might have different forms:

- The drug consumption creates a habituation with no altered mental state anymore.
- The altered state is (more quickly) terminated when the substance is broken down.
- The consumption of drugs facilitates the 'spontaneous' outbreak of pathological states. For example, the use of cannabis is linked in a dose dependent fashion to schizophrenia and other psychoses (Zammit et al. 2002) increasing the risk to a factor 6 (Arseneault et al 2002).
- The normal function does not resume, although the bioactive substance has been metabolised. In such cases of an 'eternal trip' madness becomes an eigen-value (chap. 4.2).

Many cellular mechanisms contribute to the adaptation of the organism. The density of the receptors of a cell might decrease. Then a higher dose is necessary to induce the same effect. The organism might metabolise the drug more quickly and/or antagonistic mechanisms might become more prominent leading to a shorter duration of the drug effect. All mechanisms have something in common. They tend to reduce the responsiveness of the organism to the administered substance. It is a typical teleological strategy (chap. 4.7) which aims to stick to a certain set-point (chap. 4.4). That is, the organism learns to live with the administration of the drug, and this learning 'spreads' slowly through the whole organism leading to a different homeostasis (chap. 6.7).

When a different homeostasis is attained, it is not easy anymore to discontinue the drug. The organism has become dependent on its supply from outside. This is called addiction. It happened with diazepam. It happens with many substances, as this tendency to create a dependent state is inherent in the current therapeutic paradigm (chap. 4.6).

In such a case of discontinuation the cell often multiplies its receptors (Pert 1999). As a result, a smaller doses and/or the internally produced compounds have more effect. Moreover, a later dose of the psychoactive drug will provoke a stronger reaction than the same dose weeks or months before.

These are strategies of the organism to adhere to a certain state (chap. 4.11). But this is not the only possible reaction. What is called *phase transition* in physics (chap. 4.11) can be seen in medicine, as well. A phase transition occurs when the further

administration of a certain energy leads to a total new behaviour of the system. This is seen in the spontaneous outbreak of a psychiatric diseases as through cannabis or an eternal trip as through LSD. Logically, similar events have to be expected in every therapy using the receptors of a cell. The adverse reactions type B belong into this category (chap. 4.1).

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In this autopoietic view diseases like psychosis or schizophrenia are not a definite entity. They are more a repository for different conditions of the function and the metabolism of the brain (Helmuth 2003), on the basis of the inner structure and organisation of the human, maintained out of certain inherent reasons. This has not only fundamental consequences for the diagnoses, but also for the therapeutic strategies.

Important questions in such a view would be:

- What kind of organisation facilitates such an outbreak?
- What maintains the stability of a situation?
- What factors might induce an 'unlearning', a change of the set-point?

Less important questions would be:

- What provoked the outbreak? - It might have been a minor event.
- What is the exact signalling pathway? - Due to equifinal processes different pathways might lead to the same outcome. The equifinal situation is stressed by the fact that many psychoactive drugs do not only stimulate similar receptors, but they also use the same pathways. This is seen in dopaminergic agonists (such as D-amphetamine), serotonergic agonists (such as LSD), and glutamatergic antagonists (such as PCP). Although the pathways are similar they lead to different states of consciousness (Svenningsson et al. 2003). In contrast, different pathways might lead to the same result (chap. 2.4.d).
- What genes are associated with this state? - The relation between a certain trait and a gene is often as low as 8 % for most of today's 'genetically caused diseases' (chap. 3.5, appendix IV).

\*

Although this is already complicated enough, it does not end here. The neuronal and chemical pathways are interwoven such that the distinction between a neural and a humoral system, or between the brain and the body does not make too much sense. It



is as justified to speak of a chemical brain as of a nervous brain. Stress is as neural as it is humoral. Even the insulin response in diabetes is altered by ‘mental factors’ (Gelling et al 2006).

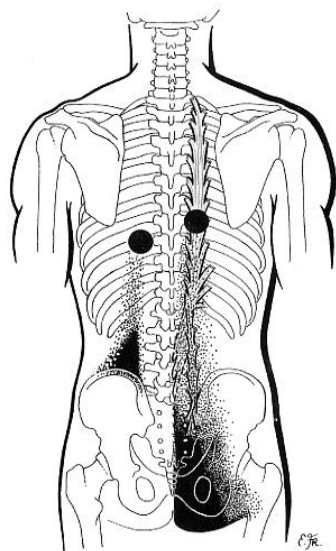
That is, to assess the reaction of the organism to a perturbation (a drug therapy, for example), the whole organisation of the autopoietic unit has to be taken into account. All the nontrivial reactions seen during a specific or an unspecific therapy cannot be attributed to the neural or of the biochemical system alone. Such nontrivial reactions are mostly not investigated, except in hormesis research (chap. 4.11; 6.10). Some of these typical nontrivial courses of events are:

- the same individual reacts differently to the same perturbation at different times. Sacks’ describes in his *Awakenings* that one patient (Martha N) took L-DOPA six times, and she reacted differently each time (Sacks, 1990).
- doubling the dose does not double the effect,
- small doses produce a different pattern than higher doses,
- a substance that might provoke a state it is able to alter it (Bastide 1998).

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### c) the visce-neuro-muscular system and specific trigger points

The visce-neuro-muscular system shows some further traits of a structurally



determined inner condition. Low back pain has many different patterns according to the muscles involved. The pain of the M. longissimus might be triggered by a tendinosis in the thoracic area (as seen in the illustration), whereas the felt pain is in the lumbar or sacral region

(Bergmann/Bergmann 1988). That is, the felt pain and its origin are found in different places. In such cases a CT or an x-ray of the lumbosacral region will not provide any useful information. It might even lead to a wrong diagnosis and to an inappropriate

therapy if alterations like spondylophytes or a discus prolaps are found by accident in the examined area.

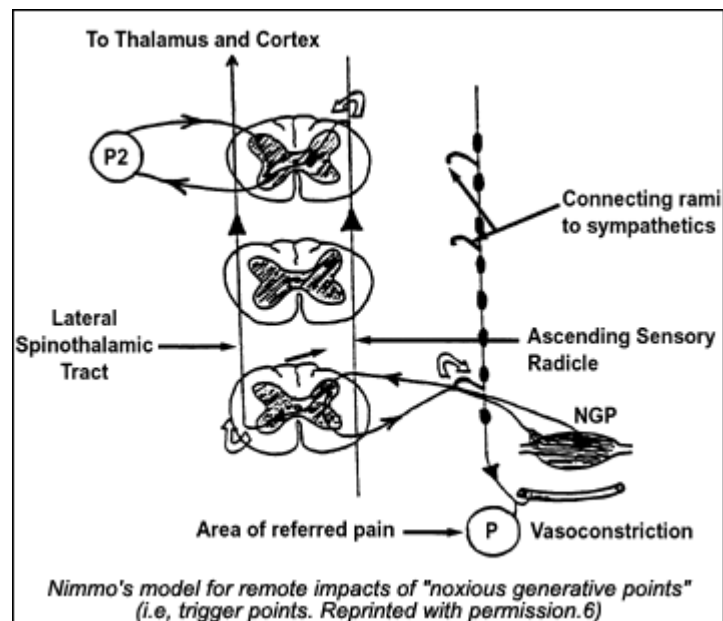
As pain makes the related neurons hyperexcitable a slight stimulus is able to provoke and maintain a state of pain (Marx 2004). That is, there is local positive feedback

mechanism where the pain increases the activation of certain neurons creating more pain. Every physician knows such self-maintaining states of pain. They resemble in their circular organisation the states of depression or psychosis described above.

Two characteristics are important in this context

- 1) The symptom (the pain) is triggered by an irritation in a different part of the body
- 2) The problem might spread out involving different anatomical structures and physiological processes.

Through the visceroneuro-muscular organisation of the peripheral nervous system (illustration, neural therapy) skin, muscles, nerves and inner organs are functionally coupled. A disturbance, like a hyperexcitation in a certain region might influence the functionally related structures. Thus, a tendomyosis in the thoracic region might disturb to some extent the function of the



related inner organs like the lung or the heart. Through the projected pain in the lumbar or sacral region the intestines and the pelvic organs might be impaired. As this interrelation is not a one way mechanism (from muscle or nerves to inner organs) the dysfunction of an inner organ or even the skin might create a neuro-muscular excitation, as well. The result is an integral disturbance involving tendons, muscles, nerves, inner organs, the skin and/or the humoral secretion.

That is, seemingly different problems are related through structure and organization. They create a pattern. This pattern can only be understood when the physician has an according neurophysiological knowledge and a theory about organisation. If not, the pattern falls apart. What remains is a deliberate (autistic) picture of unrelated symptoms.

In the described 'Latissimus-case' unspecific therapies like massage, warm or cold peloids or bodily exercise are able to heal a lot of the unrelated 'specific diseases'.

But there is also a more tailored treatment. A method based on the understanding of the functional anatomy of the peripheral nervous system is the so-called *neural therapy*. It maintains that a lot of diseases can be improved or treated just by infiltrating certain trigger points with a local anaesthetic. By that the whole visceroneuro-muscular complex might recover from the circulus vitiosus of hyperexcitation, pain and tension. For example, stress, tachycardies, constipation and/or menstrual pain might vanish just by infiltrating the trigger points of the M. longissimus. That is, understanding the principles of structure and function often enables a physician to stimulate certain points of intervention (as the trigger points) to induce a complex reaction of the whole organism which eventually leads to an improvement of health.

## 4.9 Patterns

Patterns are an difficult issue. They have been called “natural or chance configurations” (Webster’s 1976). But neither the *Encyclopaedia Britannica*, nor the reliable *Stanford Encyclopedia of Philosophy* (<http://plato.stanford.edu/>) define the word at all (5.4.08). Even the Wikipedia article on pattern has the remark that it does not comply with Wikipedia’s quality standards (5.4.08). This deficit is remarkable, especially in such - normally talkative - sources. Pattern is not only one of the most central notions in the investigation of the living. It is (one of) the most important characteristic(s) of life. Bateson, who investigated this subject his whole life, coined the expression '*The pattern that connects*'. One of his most cited statements gives an impression of the impact the idea of pattern has. He said:

*What pattern connects the crab to the lobster and the orchid to the primrose and all four of them to me? And me to you? And all six of us to the amoeba in one direction and to the back-ward schizophrenic in another?* (Bateson 1980).

\*

As the issue of pattern is not settled at all, this chapter shall just present a few findings and thoughts about patterns crucial for medical practice.

Even without previous knowledge test persons are, to some degree, able to predict how a chaotic sequence continues, impossible if the sequence is random (Novak 2002). In this case, brain research has provided some interesting insights.

Perception is not performed in a certain part of the brain. This has been known before (chap. 2.3.d). New is the knowledge that in cognition different parts all over the brain work together creating a certain specific pattern, so-called orientation maps (Kennet et al 2003). This pattern is different for every perceived item. Scientists have been able to predict with a nearly 80% accuracy what kind of item a proband has observed, just by analysing these brain patterns (Shinkareva et al 2008). Until now these have been only simple tools like a hammer. But these results show a more common trait: pattern creates pattern.

This does not happen only during the act of perception. For example, visual neurons show spontaneously orientation-maps even without being confronted with a visual stimulus (Ringach 2003). That is, although not confronted with an external stimulus the brain creates spontaneously internal patterns, even during sleep. As sleep and dreams facilitate problem solving (Wagner et al 2004, Cai et al. 2009) and help to extract rules from our experiences (New Scientist 2006), it can be assumed that the brain continuously tries to test patterns. Everybody knows this in being awake. When I learned ultrasound diagnostic (on these old machines that needed some fantasy), I saw signs of the pancreas even in carpets and wallpapers. The Rorschach tests is another tool playing with the spontaneous ability to recognize and to create patterns. There are some indications that the testing of patterns is more effective if it is not done by purpose (Association for Psychological Science 2008). Thus, it is not surprising that the usual wandering of thoughts seems also to be helpful or even essential for problem solving (Mason et al 2007). As autism is characterized by a lack of daydreams (Pearson 2006b), it might be a condition where the understanding of patterns and the ability of learning of higher order is disturbed.

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A physician is continuously confronted with patterns. Every disease is a kind of a pattern. Some are simple, some are complex as the visceroneuro-muscular interplay (chap. 4.8).

If a physician understands such a pattern in an unclear situation it is called *intuition*. Intuition is a basic characteristic of medical practice (Edwards 2004). However, there is some difficulty to cope with intuition scientifically, despite of the fact that it became of some interest in brain research lately (Traufetter 2006). Most definitions of intuition are related to ‘unconscious’ or ‘instinctive’ knowledge. But such expressions

are of no value as they replace only one explanatory principle by another. I propose as a definition of intuition: “*the understanding of patterns without a theoretical method*”. The difficulty of medicine with both, intuition and patterns, is due to reductionism. The reductionist approach is based on the measurement of a restricted number of variables (chap. 2.1.b). Of course, it is possible to describe certain patterns mathematically in one way or another (Frank 2009), but this does not bridge the epistemological gap, the fact that quantity never produces a pattern (Bateson, 1988: 110-124).. Patterns are simply beyond the epistemological tools of the current medical science. This fact might explain why diagnostic manuals are mainly concerned with symptom counting (chap. 2.1.e). Counting symptoms is in line with the concept of measurement. But it is not in line with principles perception (figure on ground) and of medical practice. This gap between medical practice and medical science is another part of the practitioner’s paradox (chap. 2.1.g).

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Patterns are the result of an interaction of more than one variable (Ashby 1960: 34). The scientific investigation of such interactions became a major boost through cybernetics. Ashby’s *homeostat* (<http://www.hrat.btinternet.co.uk/Homeostat.html>) was a simple model of feedback interactions. Quite similar is the equation which describes the love between Romeo and Juliet with the presumption that the more Juliet loves Romeo, the more Romeo dislikes Juliet, but if she loses her interest, he regains his (Strogatz 1988).

The formula leads to a simple oscillation:

$$dr/dt = -aj \quad dj/dt = br$$

where

$$r(t) = \text{Romeo's love/hate for Juliet at time } t$$

$$j(t) = \text{Juliet's love/hate for Romeo at time } t$$

This equation (although not meant as a contribution to a scientific psychology) is a good approximate of what often happens in couples. It is a stable cybernetic situation with a fixed set point as described by systemic psychotherapy (cap. 5.2). If there is no set point but a slowly increasing distance between the couple through their recursive interaction we have a schismogenetic pattern (chap 4.2). Gottman, a pioneer in the mathematical investigation of marital patterns maintains to be able to predict divorce with 94% accuracy from six variables out of a questionnaire and a 45 minute videotaped interview.

An important question is about the relevance of such equations. “Are such speculations useful to clinicians? Only if they help organize our clinical experiences, and suggest something we might not have already thought of. That is the ultimate test for the utility of speculations” (Gottman/Levenson 2002). But we should be aware of two important points. First, we use such equations anyway. We always organize our experience according to defined or mostly to undefined models. This is the simple testing of patterns which we call it intuition, experience or somehow else. Second, we test patterns not only in the field of behaviour. Every item in the web of polycontextuality is part of one or several patterns.

#### 4.10 Emergence

A term often used in the context of systems sciences and in the study of the living is *emergence*. It describes the fact that elements which are structurally interconnected produce a new behaviour not inherent in their parts. It is another way to formulate that the whole is something different than the sum of its parts, that the resulting function or behaviour is not determined by the parts. Emergent behaviour is achieved *autonomously* through interaction of the elements with one another. Such systems have been described as self-organizing or as teleological. The elements interact in order to achieve dynamically a global function or behaviour (Gershenson 2007: 32). Actually the terms emergent behaviour and pattern are to a large extend used synonymously..

Nearly everything encountered in medicine is emergent. Osteoporosis is an emergent phenomenon as it develops out of the interplay of two opposite principles, the osteoclasts and the osteoblasts, integrated into a larger regulating network. Asthma is an emergent condition of the breathing. Depression has been found to be a stress-induced overdrive of the hypothalamic-pituitary-adrenal axis creating a stable neurophysiological recursion, a typical emergent state, sometimes triggered by external factors like an abuse in early childhood (Holden 2003), financial or erotic stressors (Capsi et al 2003) and maintained by environmental factors.

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Common models to investigate emergent phenomena (that is, the interrelation between parts leading to a certain the behaviour of a whole system) are cellular automata in which individual cells stand in interrelation.

The ‘Game of Life’ cellular automaton functions at each step according to the following laws:

- any cell with exactly three live neighbours will stay alive or become alive;
- any live cell with exactly two live neighbours will stay alive;
- all other cells die.

“Certain Game of Life configurations create patterns. The most famous is the glider, a pattern of on and off cells that moves diagonally across the grid. It is possible to implement an arbitrary Turing machine by arranging Game of Life patterns. Computability theory applies to such Turing machines. Thus while not eluding the Game of Life rules, new laws (computability theory) that are independent of the Game of Life rules apply at the Turing machine level of abstraction (Abbott 2007)”

Such models makes show visually and mathematically that an emergent pattern obeys a different logic than the behaviour of its parts. This had been already Russell’s point (chap. 3.2). Although it is always possible to reduce emergent phenomena to the level of their parts, such an analysis provides no or only a minor information about the function as a whole (Abbott 2007). Such a situation is, for example, found in the interaction of genes. The step from the behaviour of the parts to the behaviour of the human, that is, the step from genotype to phenotype cannot be understood by the function of the parts. This is not a question of knowledge. It is a fundamental law of organisation (append. III).

Another cellular automaton is ‘Bittorio’. It is a circular ring made out of cells which might have the state 0 or 1. Bittorio is then dropped into a milieu of random soup of 0s and 1s. The rule is that whenever a cell encounters one of the two alternatives, the state of the cell is replaced by the state it encounters. This model has not only an inner structure, but also an environment. It is able to demonstrate how perturbations lead to certain reactions of the ‘system ring’. When Bittorio’s inner rule consists of a simple or a chaotic attractor, then the consequences of the perturbation is simply invisible. Bittorio either goes back to its previous homogenous state, or it remains in a random like state. In the case of a more complex inner rule, a series of changing sates is seen until a new inner balance is achieved (Varela et al: 151).

A perturbation (or in other words: an intervention into a system) might lead to a change if the system is not chaotic or rigid. The reaction is according to the inner

structure and expresses itself as a pattern, just as seen with the 'Game of Life' automaton. The pattern is a result of the communication between the parts and cannot be understood or described by their individual reactions.

We have here in a nutshell two further principles necessary to understand the course of events in therapies.

First, when confronted with a perturbation, the system will normally not jump to a different state immediately. The perturbation will induce a series of intermediate patterns until a new balance is found (Varela et al 1993: 151-157). Therefore a therapeutic intervention will normally not lead to a new state at once. It will show a changing pattern first. An example is that months after a surgery the health risks like cardiovascular complications are still increased (Baker 2006)

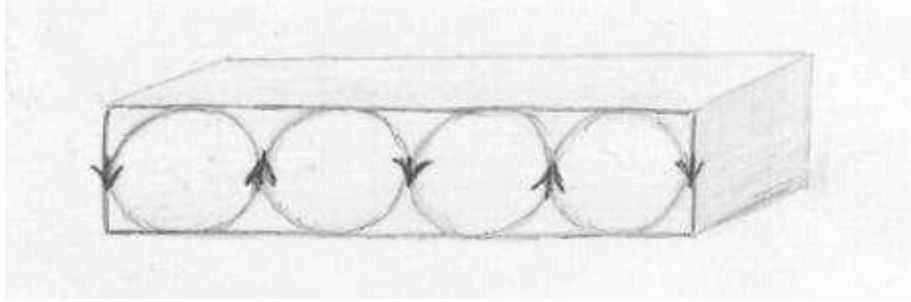
Second, if the system is rigid it will not react to perturbations and no reactive pattern will be observed. That is, the system has lost its ability to adapt. It reveals a learning zero situation. According to the principles of autopoiesis such a system is more prone to disintegrate.

#### **4.11 States and the Nature of Change**

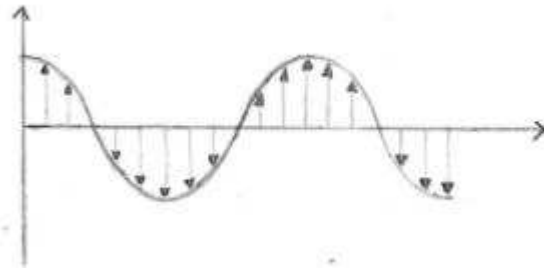
Synergetics is a concept of the German physicist Hermann Haken modelling spontaneous developments of order (Haken/Haken-Krell 1989: 6), respectively the emergence of phenomena in non-linear systems (Haken/Haken-Krell 1994: 41). It is a combination of recursive logic with chaos theory. It is here presented at some length as it reveals a lot of characteristics also important for medical purpose.

A simple example is the heating up of a fluid (e.g., silicon oil). As long as the difference of temperature between top and bottom is still small, no movement is observed. When the difference rises, the warmer and specifically lighter fluid moves upward, whereas the colder and specifically heavier fluid sinks downwards. This is no irregular process. The fluid develops a typical pattern with a sort of rotating cylinders. (Haken/Haken-Krell, 1994: 19-20)



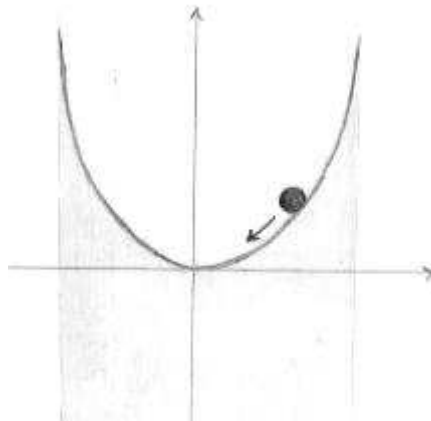


The fluid is in a relatively stable balance of which can be said that it is the best way to transport the heat to the surface. It is the best way because it is in balance.



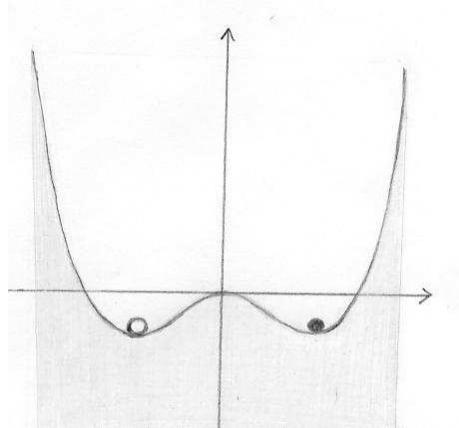
Therefore, the fluid is either at rest (little difference of temperature) or has a certain order. The order can be described by a mathematical parameter of order ( $q$ ). In the words of Haken this parameter 'enslaves' the whole fluid.

In an analogical picture, Haken compares the behaviour of the parameter of order ( $q$ ) with a ball in a hilly country. If the balance is disturbed, the ball rolls down again to the minimum (Haken/Haken-Krell, 1994: 23).



If there is only one optimum (minimum) for the present task, the valley is very narrow. Every intervention into the system (stirring in the vessel with silicon oil) will have no lasting effect. The same order as before will emerge, and, in the analogical picture, the ball will fall again to the bottom.

If the temperature is changed, the order of the fluid will change, as well. Some cylinders will grow more quickly, others more slowly. Some will survive, others not. It is Bertalanffy's struggle between parts (chap. 4.7). In the analogical picture this means that the valley becomes more flat. If the temperature exceeds a certain limit the hilly country develops spontaneously two minima, i.e., two different orders might develop. The system has to decide to follow the one or the other (Haken/Haken-Krell, 1994: 25).



Illustrations after Haken 1994: 19-25

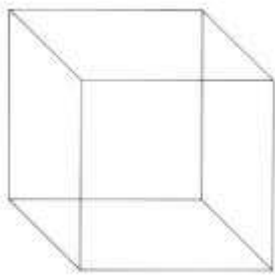
Heated silicon oil in a circular bowl has a longitudinal pattern that might have any direction. In this regard it is multi-stable. The direction of this pattern might develop spontaneously or is induced from outside through stirring in the fluid (Haken/Haken-Krell, 1994: 30).

If, through stirring, an already existing directional pattern is disturbed, this does not necessarily change the pattern. It might, however, change the direction. When enough cylinders remain undistorted they are able to reproduce the pre-existent order (Haken/Haken-Krell, 1994: 28).

This is, in very short words, the concept of synergetics. The analogy of the hilly landscape is a description of free energy (Haken/Haken-Krell, 1989: 16-17) and represents nothing else but the attractors in their basins (Haken/Haken-Krell, 1989: 50-51).

The change of a parameter (temperature) might lead to an instability. The system leaves its old state and strives for a new one. Some collective movements serve as principles of order. They might increase and enslave other parts of the system (Haken/Haken-Krell, 1989: 27). By this the parameter of order ( $q$ ) is comparable with

the operator of the recursive functions (chap. 4.2), as states are always the result of recursive processes. The emergent states can be monostable, bistable and multistable. Bi-stability, a very common phenomenon in physiology, “is the tendency for a system's output to be drawn toward either one or the other of two stable states. For example, in excitable cells such as neurons, depolarization elicits sodium entry, which in turn elicits depolarization—a positive feedback loop. As a result, large depolarizations drive neurons to fully discharge their membrane potential, whereas small depolarizations decay back to a resting state. Thus, the neuron tends strongly toward one or the other of these two states. The stability of each state brings with it a sort of intrinsic robustness— i.e., once a cell is in one state, it takes a fairly large disturbance to move it into the other.” (Lander 2004). Most physiological phenomena are based on a bi-stable processes on a cellular level, such as nerval excitation or receptor reaction. Lander could demonstrate that in *Drosophila melanogaster* bi-stability on a cellular level is also able to organize genetic expression.



Haken showed that also phenomena of perception might be explained in these terms. Rubin’s vase (chap.3.5) or Necker’s cube are typical examples for a bistable visual state.

An example for multi-stable states is the bacterium *Escherichia coli*. Although the bacterium has 7 genes and more than 1000 metabolic regulations and is able to live in many different environments (15,580 different environments had been tested in computer simulation), the bacterium actually exists in only about 5 different metabolic states (Barrett et al 2005).

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Time and again we see the described principles in everyday medical practice. Stable states can often be observed. An example of my practice: A mid-aged women developed an anaphylactic rush after she had a bath in the cold sea for nearly one hour. From that day on she always developed this rush, whenever she took a bath in cold water, even if it was only for a very short time. Similarly many pathological states just show up and remain. Adverse reactions of drugs, especially of the delayed type, mainly express that way. Often this happens in times of stress, when the person is heated up, just like silicon oil.

A classical example of heating up are the exercise ECG or the oral glucose tolerance test. These tests reveal hidden tendencies. In systemic psychotherapy it is often necessary to set the family under stress in order to reveal the pathological pattern of interaction. When everything is fine, no abnormal behaviour might be visible. Pathological states of later life often show first symptoms quite early. 4100 normotensive black and white men and women were exposed to distressing tasks (cold pressure, star tracing, and video game tasks). The larger the blood pressure responses were to each of the 3 tasks, the earlier hypertension occurred (Matthews et al 2004). In the words of the model it could be said that the valley of hypertension was very small in the beginning and the pattern of hypertension developed only when a lot of energy was administered. This pattern changed during lifetime with the hypertensive valley becoming deeper.

Important is, however, that these changes of state are rather quick. The parameter of order ( $q$ ) changes from one minimum to another just as seen in the ambiguous pictures. Change is no linear or gradual development. Not even processes like the climate change. In the history of the earth there have been two different states of  $\text{CO}_2$  levels, one around 190 parts per million during the glaciations, and the other around 280 ppm during the interglacials. No other concentrations persisted for long (Pearce 2003). There was either glaciation or conditions similar to ours. The transition from one state to the other might not have been as quickly as in the movie *The day after tomorrow*. But ecosystems rarely undergo gradual changes. Mostly the change is abrupt and sometimes irreversible (Rietkerk et al 2004).

This indicates another characteristic of states: if a state is attained, it is not changed without an outer or inner stimulus. This is even true if another state would be as likely or more likely for the defined system. Even when a transition from one state to another takes place, the system does not react immediately to the stimulus, as the parameter of order first has to leave the valley. This phenomenon is called “hysteresis”.

“Hysteresis is a term in physics that literally means to be late. It describes systems that do not directly follow the forces applied to them, but react slowly, or don't return completely to their original state: that is, systems whose states depend on their immediate history. For instance if you push on a piece of putty it will assume a new shape, and when you remove your hand it will not return to its original shape, or at least not entirely. Hysteresis phenomena does not only show up in magnetical and ferromagnetical materials, but are present in the elastic and electromagnetic behavior of materials, in which a lag occurs between the application and the removal of a force or field and its subsequent effect. Electric

hysteresis occurs when applying a varying electric field, and elastic hysteresis occurs in response to a varying force. Although the hysteresis loop depends on the material property behaviours, there is no complete theoretical description that explains the physical phenomenon....

Hysteresis was initially considered to be a dirty, unwanted, phenomena of materials. But its behaviour is now considered to be of very great importance in technology, and the property is for example used when constructing permanent memory” (Wikipedia 3.8.04)

In medicine, hysteresis is known in a lot of contexts. In antidepressive therapy a single dose of an antidepressant drug is able to boost neurotransmitter levels to the defined level, but it takes weeks to bring relief to a patient (Farley 2004).

By no means do changes from one state to another follow a linear relation of cause and effect.

Haken explains this with the laser (Haken/Haken-Krell, 1994: 38-39). Laser waves consist of one frequency and are synchronized. In order to build up the typical laser wave, a certain critical energy is necessary. Below this critical point only spontaneous emissions occur. When the critical point is reached waves become synchronized. It is a recursive process between two mirrors where the parameter of order enslaves the spontaneous emissions (Haken/Haken-Krell, 1989: 56). However, if energy is raised beyond another critical point, a totally new behaviour can be observed. The laser emits flashes of light. This means that there are different, distinct states that are attained through a gradual change of the influencing parameter (administered energy). Such points in the change of the behaviour is called ‘phase transition’ in physics. A superconductor might become a superisolator only by a slight change of temperature (Vinokur et la 2008). Some believe that the brain activity shows an according behaviour with a spontaneous activity in rest and a phase transitions towards certain patterns during action (Cowan 2008). It is rather probable that other physiological or biochemical process work the same way, e.g., the immune system.

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The synergetic model shows that the usual idea of a linear relationship between drug administration and response is not supported by scientific findings. Even the opposite, the dose related reverse effect (Kratky 2003: 83-84) is seen in physics. This phenomenon is called *hormesis* (chap. 6.10). “Hormesis, a dose-response relationship phenomenon characterized by low-dose stimulation and high-dose inhibition, has been frequently observed in properly designed studies and is broadly generalizable as being independent of chemical/physical agent, biological model, and endpoint measured” (Calabrese/Baldwin 2003). The implications of this

effect are manifold (Kaiser 2003, Calabrese 2008). A medical example for this is the protein alpha-Synuclein which might contribute to Parkinson's disease in a higher concentration and protect against Parkinson's disease in a lower concentration (Chandra et al. 2005).

As the normal medical approach does not refer to states, it is unable to say anything about the conditions under which a state arises. Although textbooks and reviews list a lot of parameters as etiological factors, they are often an epidemiological patchwork of unrelated facts. A review of schizophrenia mentions genetic factors, environmental factors as prenatal and perinatal events, social class, family structure, but also pathophysiological factors such as alterations of the brain anatomy, blood flow or neurotransmitters (Mueser/McGurk 2004). All this does not contribute to a coherent picture of development and change. This is a pity as schizophrenia and even more bipolar disease are classical examples of bi- and multistable processes.

States and their changes have been explicitly observed in family therapy. The presence or absence of certain family members may totally alter the behaviour of a patient within seconds (Minuchin/Fishman 1981).

We all know such changes through the change of the environment. We observe it in ourselves and in others. One moment we feel full of energy, the next moment we feel exhausted, or a self-confident person might become a helpless child being together with his parents.

In psychotherapy synergetics has been defined as complex '(psycho-) physiological' phenomena (Perlitz et al 2004) or as distinct affective and cognitive states of processing and experiencing (Beierle/Schiepek 2002). A report of a psychotherapy structured according to the principles of synergetics shall be analysed more in detail as it reveals some basic problems of medical perception.

Beierle and Schiepek analysed the tapes of a therapy of a young women and mother who suffered from functional problems of stomach, heart and circulation combined with fears and a lack of self-confidence. In the treatment the principles of 'brief therapy' were used (Beierle/ Schiepek 2002). The authors defined six states:

1. reports and looks for help
2. suffers and moans
3. resigns, has given up
4. feels 'real' anger, resists
5. works therapeutically
6. self-confident and active (desired state)

Of course these definitions are highly arbitrary and not convincing for a reader but might have been coherent for the observer. The description (the map) is always poorer than the territory, That is, the state of a system can only be assessed according to the parameters taken into account by an observer. Thus, every kind of diagnosis and description leaves out many aspects. As a consequence, change can only be described according to the defined state which is still much better than using only surrogate-parameters.

Beierle and Schiepek did this in observing how often and how long the patient remained in one state during the therapeutic sessions. Then they measured the changes during therapy which lasted 13 hours. By that, the progress of the therapy could be documented and at the end of the therapy she remained mostly in state 6. This process was accompanied by a lot of positive changes in her life.

This development is, of course, pleasing. It is a result aimed for by most cognitive and behavioural strategies. But according to Ashby's *Law of requisite variety* respectively to von Foerster's *ethical imperative* (chap. 4.7) a more flexible pattern would be desirable. The description of this therapy does not indicate a larger variety, i. e. the emergence of new states. It was the shift from one state to another. Under stable circumstances this might be a good result, but there is no evidence what happens in a changing environment. I personally believe that a patient with such a good development shows new states. May be this was not the case with this patient, or not mentioned in the paper, or not observed by the authors, or did not show up in the therapeutic session.

This leads to a core problem of all therapy. If a state is defined, very often it is aimed to pin the patient down to the 'desired' state, something Bateson called 'conscious purpose' (chap. 6.1). Although this seems to be an effective therapy, it is true only under certain circumstances in a certain frame of time. As it represents the change of the operand, not of the operator (chap. 4.2), long-term effects might not be touched.

These reflections show a limitation of the synergetic model. States can only be defined empirically and depend therefore on the subjectivity and theory of the observer. Due to their non-trivial nature the emergence of new states is hardly predictable by theory (Schiepek et al 2002).

Furthermore, change can only be described in terms of different shapes of valleys, how they emerge and vanish. A change on the meta-level is not foreseen. Thus, second-order learning cannot be modelled.

Another term that might lead to some confusion in this context is robustness.

Robustness can be seen as the depth of a valley, the tendency of the system to remain in a certain state.

“The robustness... is a result of the fact that the desired pattern is a stable steady state. In a system of ordinary differential equations... such states correspond to stable fixed points. These are generic features of such systems; small changes in parameters or initial conditions will not change them qualitatively” (Ignola 2004).

However, when robustness is defined in this way it cannot be distinguished from rigidity. Both are represented by a deep valley. But in terms of health, or in the judgement of the whole system, the two are basically different (chap. 6.4).

This weakness of the synergetic model is a typical example for the weakness of all physical models when applied to the principles of the living. Although valuable, they have to be used with some caution.



## 5. Observational medicine and systemic approaches

### 5.1 CAM and Observational Medicine

As a human ability, patterns and states can be understood without any related theory. Therefore it comes to no surprise that nearly all systemic basics have been described in medicine in one way or another. A lot of such concepts and observations are found in historical medical systems or in outsider methods which belong to the so-called *complementary and alternative medicine* (CAM). The complexity management found there exceeds by far the reductionist approach and “the more scientists study CAM, the more surprises and challenges it throws up. It is forcing researchers to rethink some cherished ideas about medicine, from what makes an ideal drug and the design of clinical trials to the underlying causes of disease” (New Scientist 2001). Often physicians who cooperate with CAM proponents find new insights and enlarge their own understanding for the shifting states of patients (Ots et al 2001). But the discourse between orthodox medicine and outsider methods is difficult, as CAM is not acknowledged by the mainstream medicine. Even the attempt for an open exchange between the orthodox and the CAM camp is mostly rejected, because this would assume a discussion among equals. This was, at least, the tenor of a discussion in the *Deutsche Ärzteblatt* (Deutsches Ärzteblatt 2004b) after such an initiative (Wilich et al 2004). The differences between the two sides are, in fact, enormous. Some methods as homeopathy or acupuncture even don't define diseases and the attempt to discuss on the basis of a diagnosis only deepens the rift.

The stance of orthodox medicine can often be characterized by statements like CAM "ought to be as extinct as divination of the future by examination of a bird's entrails“ (BMJ 1980 cited in Carter).

This is in contrast to the importance of CAM in general practice. In Germany, for instance, no less than three quarters of the population use at least one complementary therapy (Ernst 2003a). In the US there were more visits at CAM proponents than at orthodox physicians (Ernst 1993). CAM has big shares all over the world, even in developing countries (Singh et al 2004).

This leads to the paradox situation that a lot of physicians – against their fundamental beliefs – use CAM methods. They prefer it in unclear and mild situations as

something useless and harmless (Ring et al 2004), in order to satisfy the patient. This fulfils the classical definition of a placebo (*lat.* placebo = to please). As half of the English physicians uses also methods of CAM (Dobson 2003d) there will be many among them to practice such a kind of low standard medicine that has a bit of everything (Boon et al 2004). All this adds further to the bad picture CAM already has in the scientific community.

It is one of the paradoxes that a physician practicing low profile CAM, mainly as a placebo therapy, is better reputed than a physician practicing CAM out of conviction. Those are seen as quacks, independently of their personal integrity. A book on CAM with the title *Quack, quack, quack* (Helfand 2002) is programmatic. But the accusation of quackery is always delicate, as it implies a scientific *and* moral standard that is rarely obtained. Quackery is a typical phenomenon of all medical practice, ever since. Each kind of medicine has its own quacks. Also orthodox physicians and scientists make a lot of statements praising their therapies that often turn out to be wrong. Notorious became the sentence: “The war against infectious disease has been won” (US Surgeon General in 1967, cited in Morens et al 2004). Such misjudgements arise often and more modesty would be appropriate in every regard. It is a question of taste to call all the health promises often heard in modern medicine as quackery.

Lately many authors stressed that also CAM might produce serious side effects (except of withholding patients from the ‘correct therapy’). Such side effects include pain, fatigue and dizziness with manipulation treatments such as chiropractic and osteopathy; aggravation, needle trauma and mental effects with acupuncture; and digestive problems with homeopathy and herbal remedies (according to a poll of the Guardian, cited in Carter 1996). “Some alternative therapies have gone seriously wrong. A 40-year-old woman was killed in May last year when an acupuncture needle pierced her heart, and in September a 32-year-old Nottingham man died after taking Chinese herbal medicine. Other cases include a man who suffered a fatal stroke following spinal manipulation and two people who died from anaphylaxis—a catastrophic allergic reaction—after taking royal jelly. Serious, nonfatal adverse effects have included miscarriages brought on by aromatherapy; autoimmune disease and kidney or liver failure associated with herbal concoctions; and dangerous interactions between patent remedies and prescription drugs“ (Carter 1996).

However, not every forgotten towel in the abdominal cavity is a proof against surgery. Generally, there is a tendency in standard medical journals to stress risks and side effects of CAM (Marcus/Grollman 2002; Smet 2002), although they tend to be less prominent than in orthodox therapy (Ernst 2003a).

The low rate of side effects in CAM is normally attributed to the fact (true or not) that most of the complaints treated by unorthodox methods are not diseases but 'states of reduced well-being' which are responsive to the placebo effect. Therefore little damage can be caused by treating such complaints with 'alternative' methods (Ernst 1993).

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The controversy around CAM methods is generally characterized by an extreme low epistemological standard from all sides. Convictions are confused with proofs, arguments appear without context, etc. One reason is that the epistemological standard of medical discourse is frighteningly low, in general. Words like placebo are used by persons ignoring all methodological difficulties of RCTs. Suggestibility is a favourite notion from critics ignoring the body/mind confusion (chap. 2.3) and who also do not believe in superstition, that is, that there is a power of 'mind over matter' (Bateson 1988: 59-60). There is a lot of inconsistencies in the argumentation on all sides, especially when it comes to efficacy control (chap. 5.7).

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One thing, puzzling most scholars and common in many methods of CAM, is the vitalistic approach. In Chinese medicine it is called *Chi* in homeopathy *dynamis*. These are expressions for some sort of vital energy inherent in living beings. *Vitalism* has been regularly criticized and became a sort of an abuse in the scientific discourse. When Bertalanffy introduced general systems theory, he was well aware that his concepts of equifinality and anamorphism are very close to vitalistic concepts (Bertalanffy 1968: 79). Therefore he stressed again and again that GST has nothing to do with vitalism, maintaining that the principles of GST "are accessible to exact formulation" (Bertalanffy: 86). But all these arguments miss the main point: There is no decisive theory of the living. There are different maps to describe certain processes and characteristics, but they are all of restricted use. Life as such remains an enigma. Vitalistic concepts, as long as they are seen as a description of an observation, do not contradict any systemic or scientific finding. The problem arises only if the vital energy is seen as *causal* for living processes. However, neither in Chinese medicine,

nor in Hippocratic medicine, nor in homeopathy such causal concepts prevail. It is one of the typical misunderstanding emerging from a linear point of view. Of course, there are a lot of authors who represent a 'causal vitalism'. But they are already caught in a linear misunderstanding.

On the more general level, vitalism and systemic concepts are fairly similar. And such concepts are, at the moment, far the best we have to conceptualise living processes or processes of disease and health.

Another difficulty for orthodox medicine is that many CAM methods deal with archaic concepts in an unacceptable way. The empirical physiology of acupuncture is such an example. This 'Chinese physiology' does not coincide with Western anatomical and physiological knowledge (König/Wancura 1979: 183). And it is impossible to harmonize such different views due to the lack of epistemological tools in Western Medicine. That is, on the basis of a reductionist approach, medicine will not be able to understand other concepts. But it will also not be able to make predictable models of the living. It will not even be able to establish an individual prognosis on scientific grounds.

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This section on CAM aims to

- provide better insights concerning current medical problems by translating the "archaic" models into modern concepts,
- demonstrate processes that cannot be conceptualised with the current methodology or are simply overlooked,
- contribute to a more complex and systemic science.

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In order to do this the first step is to use a clear definition of CAM. One definition normally used says that CAM consists of "medical practices which do not conform to the standards of the medical community" (Ernst 1993a). But this definition creates a highly unsatisfactory situation. It could be a definition for quackery as well. Furthermore, it does not allow to investigate CAM scientifically.

More practical definitions are based on the regulatory principles of the body (Schimmel: 20-21): *CAM or naturopathy are methods that influence the inner regulation of the organism, such that the organism is able to develop a better inner balance or a better robustness.*

This definition creates a certain paradigm, different from the paradigm of orthodox medicine. Although it excludes some methods of CAM, it gives ground for systematic investigation. Different methods of CAM and orthodox medicine become comparable. The following review does not aim to present, explain or justify these methods. It aims to demonstrate their epistemological and methodological basis as far as they contribute to the defined purpose.

## **5.2 Systemic psychotherapy – from causes to solutions**

*Issues of this chapter:* hierarchical structure in the living; network pathologies; symptoms in the frame of an ecological context; reactions of a system after a therapeutic intervention, paradox interventions

Systemic psychotherapy does not belong to CAM or observational medicine, neither from its theoretical background, nor from its social context. It was introduced by respected people of the scientific world, it was practiced at known institutes and even at universities and it was, in opposite to most CAM methods, theory based from the very beginning. It is discussed here as it provides basic and necessary insights into the systemic approach.

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After WW II, family therapy came into the focus of interest. Many psychotherapists found that the treatment of an individual was less effective than the therapy of families. It was observed that a patient might make good progress in an individual therapy, but behaved like before, being with her family (Satir 1964). Some saw here a causal link and blamed the family (Hayes 1991). But this was an unsatisfactory situation. It put the therapists in the role of a moral instance they could not fulfil. Even more, such a view aggravated the problem in the way of the self-fulfilling prophecy (chap. 4.2). Parents, in the knowledge of their unlimited responsibility, did not behave naturally anymore and the relation between children and parents became poisoned (Dörner et al 2001).

Systemic psychotherapy came to the opposite conclusion, condensed in statements like: “Families do not fail, therapists do” (Whitaker cited in Roberto: 455). Such statements represents a radical change of attitude of the therapist and created a real shift of paradigm. The family became “the natural context for both growth and healing” (Minuchin/Fishman 1981: 11).

All behaviour of families is polycontextural and organized in a recursive manner, embedded in positive and negative feedback mechanisms. Therefore, the search for causes is quite often futile and the fight against 'causes' not effective. The simple positive feedback mechanism of anger has been described earlier (chap. 4.2). The analytic approach investigates the precise conditions of this mechanism. The systemic approach looks at the context that enables this mechanism to develop or to stop at a certain point. If someone becomes sometimes angry this is not an important issue. But it might be, if someone is always or often angry or cannot control it anymore, that is, if there is no mechanism to control the positive feedback leading to an exponential runaway.

When a certain circuit gets out of control it has to be seen as a disturbance of the cybernetic interplay of the whole system (Bateson 1972: 430-431), as a network pathology (chap. 6.7).

Classical examples for circular relations creating problematic situations are the wife who nags because her husband drinks and the husband who drinks because his wife nags; or the child that does not want to go to school because his mother is so anxious and she is anxious because her husband is always angry and the husband is angry because the child does not want to go to school. In such cases quite often the attempt to control a situation (the uncontrolled anger of a patient, the husband drinking or the child not going to school) serve even as an amplifier, as a part of a schismogenetic pattern.

It is not up to the physician to decide, how a family should live, how it carries out its tasks. This would involve personal values. Every family has its own values, its own theories in how it should behave. This has been called the '*myth*'. Myths may govern the behaviour and communication of all family members, such that everybody tries to influence the other to obey a certain value, a set point. It is important for the therapist to be aware of this (Papp 1983: 154) and not to confuse it with his own values. The main question is therefore, *how well* a family is able to carry out its task

(Minuchin/Fishman: 20). In the normal case, "the healthy family finds creative ways to reconcile present needs with the past traditions and values that cycle slowly through current living" (Roberto 1991: 448).

Emotions in such a network are an expression of the family structure and not an independent or individual issue. Minuchin and others could trace this down to the physiological parameters. Insulin and catecholamins in the blood of a child change

when observing arguments between its parents. We all experience this in one way or another, feeling relaxed in one company and stressed in another. Often it is impossible to explain why we feel that way, but it has clear consequences for our metabolism.

Minuchin and Fishman talked in such a case of a '*conjoined physiology*' (Minuchin/Fishman: 12-13), others of *family somatics* (Kröger/Altmeyer 2000). This concept of a conjoined physiology resembles the neurophysiological mirroring (chap 4.2).

Problems might arise, when the family becomes stuck at a transition point in its life cycle (Hayes 1991), when children go to school or finish it, when parents get a new job or lose it, when new persons become attached to the family, at certain round birthday numbers or when members of the family become ill or die, that is, when the situation is 'heated up', such that special patterns and states develop, just as seen with silicone oil. (chap. 4.11)

In such cases the symptom of a family member might have a stabilizing effect. The typical example is the child becoming asthmatic when the parents have a tendency to separate. A physiological explanation would be that the family tension increases the stress hormones in the child facilitating asthmatic attacks. The concern of the parents makes them more cooperative and brings them closer together. As the situation relaxes, the asthmatic symptoms decline. This, the child becomes an indicator of the stress level of the family. Simultaneously the child also gets some power over the family communication. For example, parents often report that the child becomes symptomatic, as well, when the relation between the parents is very good. This can be explained with a felt set point of the child concerning the distance between the parents which has to be maintained. Any divergence from this inner picture produces stress and symptoms.

In such a situation the whole family seems to be governed by one member, or better by the symptoms of one member. Maybe a certain disease or symptom is accidental at first. But with the time it develops an own meaning, a signification. Often the metaphoric interpretation is heard that an asthmatic crisis is an expression for a 'suffocating situation'. Such metaphors play an important role in the development of an homeostatic process (Papp: 141-142). But the crisis might produce the suffocating situation it is the consequence of.

Stability or homeostasis is not maintained by the symptomatic member, the so-called *identified patient*. This would be a misunderstanding of networks. Such a symptom

“represents a convergence of prescribed family roles and legacies, biological predisposition in the symptomatic member, previous attempts by the family to solve the problem, and perhaps random misfortune, as well” (Roberto: 451-452). A symptom might be somehow accidental at first, but through a long-standing, repetitive pattern of interaction (Papp: 140) the situation becomes rigidified (Roberto: 451), developing a homeostatic regulation. In the terms of synergetics it could be said that the problem arises when there is only one possible state for the family, whereas according to the internal and external conditions a different state or different states would be more probable and better adjusted.

This process does not only involve the family members. The physician becomes part of it, as well. His intervention contributes to the outcome, whether he wants it or not, especially as the family has the possibility to choose a physician who matches best its pattern. He might contribute to the problem by deepening the valley of the state. For example, he might treat the insomnia with drugs making patients dependent, or by inducing other self-fulfilling prophecies (chap. 4.2).

If there is a homeostasis including the identified patient being ill, the system ‘family’ will protect itself against disturbances from outside. Outer influences in order to change the internal pattern might provoke a reaction of the system against this intervention. Or, if something is changed in the identified patient another member of the family might counter-balance this by becoming symptomatic (Hayes 1991), as shown in the case of the hyperkinetic girl (chap. 2.2) and the autistic boy (chap. 6.8). In a case where the family pattern is rigid it becomes difficult to influence it from outside, because the family will try to continue the same pattern all over. The attempt to change such a pattern is as futile as stirring in heated silicone oil (chap. 4.11). At best, the direction of the pattern changes, but not the pattern itself. In heated silicone oil the pattern resumes after any disturbance because it is the optimal form to transport heat to the surface. The same is true with ‘heated’ families.

Treating a symptomatic child leaves the family pattern unchanged. Drug therapy in such a case solidifies often only the rigidity of the family structure, not only the rigidity of the individual metabolism (chap. 6.6).

But psychotherapy is often not better off. The more open and direct the therapist tries to re-educate a disturbed family the more probable it is that he induces processes that lead to a stronger rigidity (Haley 1963: 225)



It does not really help to understand the situation. First, understanding depends more on our values. Second, knowledge is no therapeutic means. It is as often in medicine: we might “learn a lot but not change much” (Keith and Whitaker cited in Roberto: 466).

The essential contribution of systemic psychotherapy is its different stance towards therapy. It is a shift in attitude. Instead of searching and altering self defined causes, it tries to find solutions.

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In systemic psychotherapy there are several schools with different techniques and theories how new solutions can be obtained. However, every school uses also the techniques of the other schools. “The truth is that different systems of family therapy are more alike in practice than their theories suggest” (Nichols cited in Hayes 1991).

These different schools can be divided into two major classes, the ‘structural’ and the ‘strategic’ approach. This division does not only distinguish different approaches in psychotherapy. It might also serve as a blueprint for judging different methods of empirical medicine and those parts of orthodox medicine which exceed the strict reductionist model.

#### **a) structural psychotherapy**

The basic idea of structural psychotherapy “is that families develop structures (i.e., regulating codes and patterns in which they relate), in order to carry out functions or roles (e.g., partner, breadwinner, care giver, disciplinarian)... It is assumed that there is an invisible set of rules, based on the family’s culture and societal demands, that organize and regulate people’s behavior” (Hayes 1991). It is a normative model that refers to the question which authority is held by the family members (Hayes 1991). „The parents have the right to make decisions that are related to the survival of the total system” (Minuchin/Fishman: 18). If authority is not correctly performed then dysfunction or diseases might arise. Chaotic families are a source of many health problems and even influence negatively the cognitive abilities of its members (Petrit/Plomin 2004).

The structural approach stresses the importance of clear boundaries (both internal and external), as healthy families are characterized by such boundaries (Roberto: 446).

Families are seen to be endangered to become dysfunctional, when natural boundaries are violated. An example is when children become the parents of their parents, the so-called parentification of a child. This might happen when the children have to take the decisions for their parents, a breeding ground for problems (Papp: 171). Another known pattern is the mother who has to mother her husband, because he behaves like a child in most issues of life.

Another issue are stable coalitions between the mother and the child against the father, or by the grandmother and the grandchild against the mother, etc. Sometimes families are enmeshed, such that nobody seems to decide what happens and every member pretends to behave only for the good of the others. In such families a sense of obligation, self sacrifice and self-denial prevails (Roberto: 450)

All this involves a certain judgment from outside, from the therapist. But structural therapists do not try to impose their concept onto the families. They try to induce a change in the family, in order to help the family to overcome the deadlock of a repetitive and/or inadequate pattern. The structural approach is not concerned with the symptoms but with the general structure, bringing forth the inadequate behaviour. It is a therapy on a higher level of order.

Some techniques to influence the family pattern are

- changing the perception of the process,
- proposing alternative possibilities that make sense,
- introducing new relations and reinforce them (Hayes 1991)<sup>13</sup>

There is a main difference to the causal approach. The therapist does not force the family to obey a pattern the therapist judges to be correct. He might propose some tasks or induces new reflections.

If an asthmatic child governs the family and protects an endangered marriage (at least according to the theory from outside), the therapist has many possibilities to influence the rigid pattern. He might encourage the child to undertake new activities outside from home (with the danger that the child is unable to do this because it becomes symptomatic). He might work with the parents and look where their needs are unfulfilled (with the danger that the child becomes symptomatic if something changes). He might impose some exercises where the parents definitively decide and the child has to follow, such that the parents learn or relearn how it is like to decide

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<sup>13</sup> The introduction of new relations (öinks) is a general method to increase robustness, even in genetics. (chap. 6.4)

and to be responsible for a situation. If there are coalitions, such as a mother and child dyad, he might give some exercises where the father and the child have to undertake something together (with the danger that suddenly the mother might become symptomatic). There are a lot of possibilities and the therapeutical process has to be handled creatively as always unforeseen events happen.

Although the basic theory is normative, the therapeutical practice is based on a stimulus-response pattern (chap. 6.10) which obeys the principles of equifinality (chap. 4.7). That is, the system family has, if a change is induced, the ability to find its own solution according to its inner structure. In the synergetic model this means that the ball will find a new state or changing states, if the dysfunctional valley is abandoned. To achieve this, it might as well be necessary to 'heat the situation up'. This represents a form of 'initial deterioration' (chap. 6.11).

The largest ever trial in structural psychotherapy was the combat of crime in New York at the end of the 20<sup>th</sup> century. After all attempts had failed to control criminality with first order strategies, there was a shift of paradigm based on the concept of the 'broken window'. A car with a broken window is immediately robbed, something not (or at least less) true for a car in 'order'. The strategy of the city of New York was to keep an outer order. All graffiti were immediately removed, streets were held clean from rubbish or animal's excrements, etc. With such interventions, not concerned with the symptom, but with the structure, crime rate fell about to the half, a wonder nobody had expected (Wikipedia, "Fixing broken windows, accessed 27.6.16). This structural intervention was probably the most effective intervention for the health of New Yorkers ever, prohibition (a first order intervention) included.

Another structural intervention was to reduce the class size in U.S. primary schools. The health of the children improved impressingly. It was even cheaper to reduce classes than to treat diseases (Columbia University's Mailman School of Public Health 2007).

### **b) strategic psychotherapy**

Strategic family therapist believe that families tend to organise themselves according to particular sequences of interaction (Hayes 1991). The therapists are concerned with the relational pattern that serves as paradigm. They expect that whatever arises, will bring the family to react according to this typical pattern. In periods of stress this pattern might become more expressive leading to wrong solutions, because it is so

rigid. In cybernetic terms it can be assumed that the family enters a positive feedback loop or a vicious cycle when under stress (heated up). The problem may even be intensified by the family's attempt to interrupt it. Then the solution becomes the problem (Hayes 1991).

Strategic therapy looks at the organisation of the symptom. The symptom is absolutely central and has to be investigated profoundly in regard to relational patterns and the themes that are involved (Papp: 140). So a lot of time is spent in conceptualising the symptom. However, strategic psychotherapy is not so much concerned with the genesis of the repeating pattern in which the symptom is involved (Papp: 141). It is more interested in how it expresses itself and how it is maintained. The strategic therapist believes that the quest for a cause may delay or restrain the family from finding a new and more adequate pattern.

The symptom serves as a starting point for the therapeutic intervention. As all behaviour has a meaning in the context of the family, the signification of the symptom has an importance, as well. When interventions are not aimed at the issue that is most central in maintaining the problem, change, if occurs at all, tends to be peripheral or temporary (Papp: 154). This is comparable to the trigger point of the visceroneuro-muscular system (chap. 4.8.c).

If a change is introduced through the intervention in one, the others will inevitably change as well (Papp: 145). If a couple has a typical feedback pattern and one partner abstains from participating in this game, the other has to react. He might slow down or, what is more probable in the beginning, will grow wild in order to provoke the other to participate in the usual pattern. This is often seen in quarrelling couples. When one partner does not participate in the usual pattern the other will become extremely offensive such that the former gets furious and only after an intensive fight both partners are able to calm down.

The necessity of a reaction has been illustrated with a sailing boat where both partners sit on opposite sides on the edge, the typical schismogenetic balance. If one of the two goes back into the boat, the other has to react. He will also go back into the boat or will fall over board or the boat will capsize.

This is, in fact, a critical point. Every ill-considered intervention from outside might provoke enormous harm. Probably many situations had worsened and families had unnecessarily been dissolved through therapeutic interventions that violently

disturbed a fragile balance, even if, or especially if a symptomatic or ill person is involved.

(Comparable developments can be observed in any other regulative network of the human, concerning all sorts of physiological processes, including initial deterioration, chap. 6.11).

The therapy has therefore to disrupt the self-reinforcement cycles carefully. Then the family might find a more adequate behaviour on its own. Finally, the symptom ceases as there is no supporting structure anymore. The therapist does not introduce the behaviour. He even might not understand what all this means. Actually he will never understand as "there are as many causes of x as there are explanations of x" (Hanson 1972: 54), and in behaviour explanations are numerous.

The strategic psychotherapist tries alter the rules by

- altering the families perceived reality,
- provoking a counter-reaction,
- bringing the family in a dilemma,
- challenging the family's belief or to construct a new reality

These techniques (and this is also true for the strategic therapies in general medicine) use the symptom to destabilize the whole situation in order to attain a more sustainable effect. They aim to change the frame producing the symptom.

Some typical strategic techniques are:

#### *a) Reframing*

This is the actual attempt to alter how a certain situation is perceived leading to a process of change. Reframing has an immense power as it induces change just by altering the semantic structure of behaviour. It does not change the behaviour as such. It influences the operator of a recursive process.

#### *b) Paradox intervention (prescribing the symptom)*

Supporting the existent behaviour and symptoms is the basis of the paradox interventions. They are based on the reflection that any attempt to intervene in a homeostatic process provokes a reaction against this intervention. The best possibility to avoid this is to go with the symptom.

- A boy in adolescence was regularly quarrelling with his mother and finally beating her. Every attempt of others to change his behaviour had no effect. The family was instructed to gather once a week and to act according to the usual pattern. Son and mother had to quarrel as usual and the son had to beat his mother. If the son did not behave in the usual way, for example did not

beat her hard enough, the mother had to encourage him to fulfil his task correctly. At the end the mother had to kiss her son and to state that he had fulfilled his task good. After some weeks the behaviour of the family had changed and the symptom had vanished (Paritsis: personal communication).

- A woman was afraid to leave the house alone. Even for shopping she needed the help of her husband. He supported her wherever he could. The therapeutic order was that the husband had to instruct his wife every morning that she should under no circumstances leave the house. After several days she left the house for the first time after eight years. However, as a reaction, the husband became concerned with what his wife might do being out alone (Haley: 191).

Another paradox intervention is to stress the danger of a too quick change (Papp: 145). All difficulties and implications that might arise through a change (as referred above with the asthmatic child) can be discussed extensively. Interestingly, in this frame such predictions do not work as self-fulfilling prophecies. Practically, they have the opposite effect. Prohibiting change because a certain danger is seen is more beneficial than helping to avoid the present situation because the same danger is seen. This is supported by basic cybernetic models (Bateson 1988: 120).

### *c) Pretending*

Pretending is a kind of subspecies of a paradox intervention. It is used when a family is governed by a symptom absorbing all attention (the regular asthmatic attack of a child, the vertigo of the wife, the oppression in the chest of the husband). Then the symptomatic patient can be instructed to pretend the symptom regularly. He is obliged to simulate the symptom according to a time table which the other members of the family do not know.

\*

The question why and how paradox interventions work is controversially discussed. The question is, in a way, an invasion of linear thinking into systemic concepts. My favourite explanation is that in order to fulfil a task the family has to find a consensus and a cooperation on a meta-level that serves as starting point for an improvement of inner balance. This concept of 'meta-level harmony' is in line with other methods of naturopathy. But this is only one of many attempts to explain the observed effect. Paritsis counted about 20 possibilities to explain the effectiveness of paradox interventions (personal communication).

\*

Based on these principles different therapeutic approaches have been developed. Quite known became the Milan school. "They rejected the notions of hierarchy and

examined how different levels of meaning were related to one another. They focused on pattern and information, rather than on structure or form” (Hayes 1991). Although it was mainly a strategic approach, the Milan school saw itself in the tradition of second order therapy, where a family’s reality is based on the circular construction of truth. (Selvini Pallazoli et al 1995). As a consequence, “the therapist will not make the stance of arguing for change nor imposing therapeutic goals onto the family. Problems are believed to arise when the therapist loses neutrality” (Hayes 1991).

Later, however, the Milan school split up and the main proponents followed a quite rigid structural approach (Selvini Pallazoli et al, 1989).

It has been said that the structural therapy uses negative feedback mechanisms, strategic therapy positive feedback mechanisms and the school of Milan both. (Hayes 1991). But such descriptions have more to do with the theory of the early proponents of systemic psychotherapy, positions that have been abandoned towards a more empirical stance.

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Many objections have been made, especially concerning the therapist’s ability to judge the structure of a family, stressing the lost coherence of modern family and the current inability to communicate (Anderson 1999). The ‘postmodern’ approach, therefore, rejects all conceptual techniques and is mainly organized around narratives. However, by that, systemic thinking is abandoned. This is highlighted by the fact that the family as such is no longer the centre of interest (Minuchin 1998).

### **5.3 Hippocrates – Rhythms and Logic**

*Out-of-date theories are not in principle  
unscientific because they have been discarded.*  
**Thomas Kuhn** (p. 3)

*Issues of this chapter:* precise observation; observation versus theory, concepts of homeostasis, principles of inflammation, critical days, inner rhythms and their suppression, individual prognosis, understanding the inner hierarchy, processual diagnosis, effectiveness.

Hippocrates plays an outstanding role in the history of Western medicine. Each generation interpreted him its own way (Smith 2002b) and it seems that it is possible to trace back every kind of medicine to Hippocrates, ‘reinventing’ him each time according to the current paradigm (Cantor 2002).

When Hippocratic medicine is discussed today it concerns mainly the ethical issues, especially the ‘*nil nocere*’ (Jakob 2004), the oath (Markel 2004) and the idea that doctors are much more artists than scientists (Smith 2004c). His pathophysiological concepts are normally rejected, not astonishing after 2.500 years. At most he is praised for his precise descriptions that enable us to understand what the patients ‘really’ had. But a more subtle analysis shows that a lot of the Hippocratic pathophysiological concepts are surprisingly in line with modern concepts. Furthermore, Hippocrates<sup>14</sup> used concepts of inner balance, observed rhythms and understood healing as a process with an inherent logic. That is, Hippocrates might be reinvented as the father of a systemic medicine.

### **a) poise and inflammation – the old and may be the new paradigm**

Hippocratic medicine is based on a theory of humours. Although it seemed to have followed the four valued system of blood, phlegm, yellow and black bile (*The nature of man IV*, Hippocrates IV: 11), this system was handled much more pragmatically than in later centuries. The correct mixture of the humours (*krasis*) is health. “Balance is a sign of health, imbalance, a harbinger of disease” (Hanson AE).

The idea of an inner balance, of a *milieu intérieur*, as Bernard called it, is well in line with modern thinking. However, our concepts are more complicated. We know a lot of different humours, and inner balance comprises also cellular and neurological organisation. The four valued system of the Roman medicine has no equivalent to our concepts. We see mainly an antagonistic principle (sympathicus/parasympathicus, osteoblasts/osteoclasts, polarisation/depolarisation, Th1/Th2 helper cells) that might form cascades (as in blood clotting or immune response) or is embedded in circular networks with a lot of positive and negative feedback mechanisms.

Many, if not most diseases arise when this ‘humoral’ balance is distorted. However, it is not too common to describe diseases as an imbalance. Stress theory was an important step towards this direction. But today stress has become an explanatory principle and is hardly used as a specific description.

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<sup>14</sup> Hippocratic texts are collected in the Corpus Hippocraticum. It is a selection of texts from different authors and different centuries. This chapter mainly uses epidemics I and III, prognostic, regimen that, according to most scholars, date back to the fifth century BC, are probably written by the same author and represent the thinking of the so-called Coan school. To simplify matters these texts are attributed to Hippocrates, independent of any historical truth.



Stress theory and Hippocratic medicine – both based on the concept of an inner balance and its disturbance – resemble even in details. Both see the cause for imbalance and disease in unusual inner and outer events such as climatic changes, too much eating, drinking or exercise. Only their pathophysiological models differ. In Hippocratic medicine an imbalance arises when one fluid prevails in its pure, unmixed form. Then it becomes noxious. The presence of such a ‘crude’ substance can be seen in bleeding from the nose or intestines, in vomiting yellow bile etc. This crude substance is able to move inside the body (rhume). It has to be evacuated in order to regain inner balance, what is best done by ‘cocting’ it before. The catarrhally discharge of the nose would be such an evacuation of a cocted fluid. If coction is not possible, the body has to store the fluid somewhere. This so called *apostasis* has been translated with abscession. But this is only partly the right word. Abscession is already a purification, an attempt of the body to cocte the *apostasis*.

The coction, especially in *apostasis* is always associated with a crisis. „Coctions signify nearness of crisis and sure recovery of health, but crude and uncocted evacuations, which change into bad abscessions, denote absence of crisis, pain, prolonged illness, death or a return of the same symptoms“ (*Epidem I. XI*; Hippocrates I: 163-165).

If evacuation is successful than health will be restored. If evacuation is incomplete a relapse can be expected. If the body is not able to bring the crude substance under control or if the abscession is in a prognostic bad part of the body, then the patient dies. The process leads either to a restitution or to death according to the disturbance and the inner stability of the patient.

If we try to compare the Hippocratic concepts with modern physiology it is striking how much coction resembles the notion of inflammation. Inflammation is a structural determined reaction of the body for healing purposes and became a central issue in recent years, “leading us to rewrite medical textbooks” (Phillips 2003a). Many chronic diseases as all kind of autoimmune disease, asthma, rheumatoid arthritis, heart attacks, Alzheimer's disease and cancer are associated or contributed to inflammation. The old macroscopic definition of heat, swelling, pain and impaired function has made room for the microscopic process of *apoptosis*. Apoptotic cells commit ‘suicide’ in order to induce the inflammatory process and are cleared away making this process self-limiting.

Chronic diseases occur when the normal course of apoptosis fails. Then apoptotic cells are not cleared away as soon as normal, maintaining inflammation. An aim of new therapies is to speed up the resolution of an inflammation (overview: Holmes 2004). But speeding up inflammation to avoid or resolve prolonged *apoptosis*, or speeding up coction to avoid or resolve *apostasis* is much the same process, the one on a microscopic, the other on a macroscopic level. Both even possess the notion of evacuation.

That inflammation plays such a crucial role in many diseases can be seen in the beneficial role of NSAIDs, especially of salicylic acid. It has a preventive effect in arteriosclerosis, heart attack (Phillips 2003a), strokes (Morgan 2004), all kind of cancers (Terry et al 2004, Marx 2004c), cataract (Crabbe 2004), Alzheimer's disease (Etminan et al 2003) and others.

Salicylic acid is part of the natural diet and a nutrition high in salicylic acids is correlated with lower incidences of diseases attributed to chronic inflammation (Morgan 2004).

The low content of salicylic acid of modern diet might be one factor for the shift from acute diseases in ancient times to more chronic diseases that mainly happened in the 19<sup>th</sup> and the first half of the 20<sup>th</sup> century. It might even be possible that in Hippocratic times the processes of inflammation was slightly different and more acute. This would explain why no chronic diseases are mentioned in the Hippocratic texts.

There are, however, other explanations. Chronic diseases might had been of no concern in Hippocratic times, the respective texts might have been lost or people died so early that there was too little time to develop a chronic disease. All these reasons have their justification. But the study of Hippocratic medicine provides more evidence why chronic disease prevails nowadays.

## **b) critical days and chronomedicine**

Coction is associated with certain critical days. These are the days where a disease might become better or worse. "Fevers come to a crisis on the same days, both those from which patients recover and those from which they die" (*Prognostic XX*; Hippocrates II: 43). These days are 4., 7., 11., 14., 17., 20., 34., 40., 60. But slightly differing critical days have been observed as well (*Epidemics I, V*; Hippocrates I:155-157).

No part of Hippocratic medicine has provoked so much disapproval by modern scholars as these critical days. They have been called a mysticism of numbers inherited from archaic times or just an extrapolation of the rhythms of malaria to other types of fever (Lichtenthaler: 130). It would be an interesting task to investigate how such and similar misjudgements arise. How should it be possible that a precise observer like Hippocrates would make such severe mistakes? Indeed, critical days exist.

In *chronobiology* and *chronomedicine* exactly these types of rhythms have been described. A circaseptane periodicity can be seen in the swelling of wounds and others (Hildebrandt et al 1998: 33). In psychosis a circaseptan rhythm is common, but a periodicity of 14 and 21 days is seen as well (Hildebrandt 1998: 32). All kind of complications arise in a circaseptan periodicity such as the rejection of transplanted organs (Hildebrandt, 1998: 119) or in scarlet fever (Hildebrandt,1998: 118).

The circaseptane rhythm starts with the disturbance or (in a therapeutic context) with the therapeutical stimulus (Hildebrandt 1986: 214) .

Except of a circaseptane rhythm *chronobiology* also demonstrated a circadecane rhythm, further supporting the observations of Hippocratic medicine. The circaseptane rhythm is more ergotrope, the circadecane rhythm is more trophotrope (Hildebrandt 1986: 192). However, there are some slight differences between Hippocratic perception and *chronobiology*. E.g., for *chronobiology* the first critical is the 3<sup>rd</sup>, for Hippocratic medicine the 4<sup>th</sup>.

On critical days a diseases should change. “In all cases where fevers cease neither with signs of recovery nor on critical days a relapse may be expected” (*Prognostic XXIV*; Hippocrates II: 49). This is not true for fever alone, but also for other kinds of inflammation such as erysipel (*Prognostic XXIII*; Hippocrates II: 47). If there is no change on critical days then the prognosis is bad. This, again, is in line with the observations of *chronobiology*. A more prominent periodicity in an infectious diseases indicates a good prognosis (Hildebrandt et al: 33).

Modern physicians do not observe these rhythms because they have no according theory. But this is not the whole explanation. As most Hippocratic rhythms are associated with fever, these rhythms cannot be observed today, because they are suppressed by antipyretics.

This is a very crucial point. What happens to all these suppressed rhythms? Do they still exist, but unseen? Is their pattern changed? What does this mean for cybernetic circles, for the processes of the disease?

Experiments have shown that fever enhances the immune response (Chen et al 2006) and children with high fever before the age of one are less likely to develop allergic sensitivity later (Williams 2004). May be the suppression of fever through antipyretics contributes to the development of chronic disease. In fact, the use of paracetamol in the first year of life and in later childhood is associated with an increased risk of asthma, rhinoconjunctivitis, and eczema at age 6 to 7 years (Beasley et al 2008).

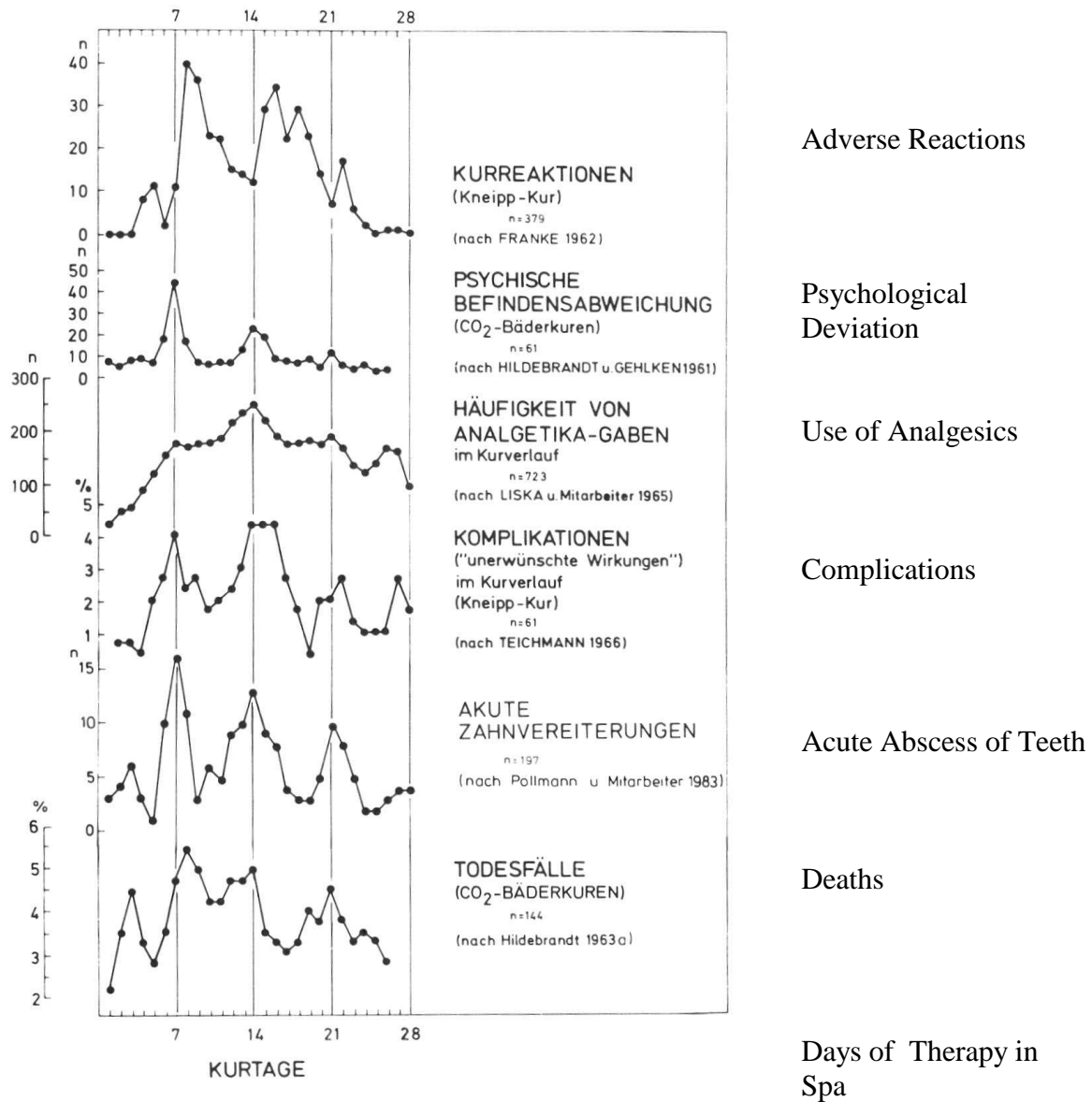
Although there are only a few theoretical concepts how suppression in general is able to lead to more severe states (chap. 6.8), in the case of inflammation there is some evidence that the use of NSAIDs might harm. For example, they inhibit the healing of a tendon-to bone operation in animals (Cohen et al 2004). Also some gliomas are more frequent under an anti-inflammatory therapy (American Association for Cancer Research 2006). Probably they prolong *apoptosis*. That is, the same drug which prevents chronic disease is harmful in acute disease. And even in chronic disease the results are sometimes mixed

May be it is the lack of the crisis, suppressed by current therapy, which leads to chronification? There is some probability for this assumption as in chronic diseases, prevailing nowadays, there are no rhythms nor time structures (Hildebrandt et al: 33). Indeed, the loss of the circadian rhythm due to modern life is held responsible for a lot of chronic diseases, even for cancer and bipolar disease (Phillips 2009).

Rhythms might reappear. This has been observed mainly during balneological treatments in spas. This reappearance, again, follows exactly the Hippocratic pattern of critical days. That is, complications in spas arise with the typical periodicity (Hildebrandt: 191).<sup>15</sup>

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<sup>15</sup> Illustration by courtesy of Springer Verlag, from: Hildebrandt G (1986): Chronobiologische Grundlagen der Ordnungstherapie, in: Brüggemann W (ed.), Kneipptherapie, Springer, Berlin, page 191



This reappearance of rhythms is known in practically all methods of CAM which aim to restore the inner regulation. In CAM this phenomenon is called as ‘initial deterioration’ or ‘initial adverse reaction’ and means that at the beginning of a regulative therapy the symptoms might get worse and/or old conditions of disease might reappear (chap. 6.11). This is seen as a favourable development, just as the critical days in Hippocratic medicine.

**c) the logic of the process**

The most difficult part in the understanding of Hippocratic medicine is the principle of how an individual prognosis can be established. It is difficult because it is incompatible with our current medical paradigm. Modern medicine has knowledge of

partial processes and probabilities. An individual prognosis is no issue. However, the practitioner will often give an individual prognosis in his daily work. He might do this out of his experience and will, although not covered by scientific evidence, often be correct. But more often these individual predictions are of poor quality.

It is something special that Hippocratic medicine provides rules for such an individual prognosis. Hippocrates even encouraged the physicians to predict the individual course of disease. "I hold that it is an excellent thing for a physician to practice forecasting. For if he discover and declare unaided by the side of his patient the present, the past and the future, and fill in the gaps in the account given by the sick, he will be the more believed to understand the cases, so that men will confidently entrust themselves to him for treatment" (*Progn I*; Hippocrates Vol. II: 7). As Hippocrates stressed individual prognosis so much and was known to be an excellent observer there must have been something true in his system.

In systemic psychotherapy the individual prognosis (explaining present, past and future) plays also an important role. If the principles of the family interaction are understood, it is not difficult to explain to the family their 'game', how it developed and how it will end. Such predictions are sometimes used as a self-fulfilling prophecy, sometimes to avoid the predicted outcome, sometimes, just as intended by Hippocrates, to develop trust in the therapeutic process.

To be sound, a prediction has to be founded on the principles of control and development. Quite the same can be found in the case of the Hippocratic prognosis. The art of his prognosis is based on a careful examination of all symptoms in their rhythmic and dynamic aspect. For example, Hippocrates differentiates fever according to its rhythm and circadian expression: "Day fevers, night fevers, semitertians, exact tertians, quartans, irregular fevers" (*Epidemics I, V*; Hippocrates I: 155). "Each of these fevers has its modes, its constitutions and its exacerbations" (*Epidemics I, XXV*; Hippocrates I: 183). But also all kind of alterations of the face are taken into account (*Prognostic II*; Hippocrates II: 9). Furthermore, every symptom is related to clear-cut structural principles (Lichtenthaeler: 147).

Basic rules in establishing a diagnosis are: If general signs (fever, weakness) become better and an *apostasis* occurs it is a good sign. The opposite (an *apostasis* vanishes and fever occurs) is a bad sign. A metastasis of the process to the lower part of the body are prognostically good (the opposite bad).

“Whenever from pneumonia an abscession takes place to the ears, while gatherings occur in the lower parts and fistula forms, the patient recovers. Judge of such cases in the following way. Expect abscessions of this kind when the fever holds, if the pain have not ceased and the expectoration be not normal, if the stools be not bilious, nor become loose and concocted, if the urine have not a very thick, copious deposit, but be assisted favourably by all the other favourable symptoms. The abscessions occur, some to the lower parts, whenever some of the phlegm appears in the region of the hypochondrium, others to the upper parts, whenever the hypochondrium continues to be soft and painless, and the patient suffers from a temporary shortness of breath which ceases without any manifest cause.

Abscessions to the legs in severe and critical pneumonia are all beneficial, but the best are those that occur when the sputum is already changing. For if the swelling and the pain take place at the same time as the sputum is turning from yellow to purulent and is being evacuated, the patient is quite certain to recover, and the abscession will very quickly come to an end without pain. Should, however, the sputum be not well evacuated, and the urine do not show a good deposit, there is a danger that the limb will be lamed or else cause much trouble. Should, however, the abscessions disappear without the evacuation of sputum and while the fever lasts, the prognosis is bad, as there is a danger lest the patient become delirious and die. When empyema occurs as the result of pneumonia, older patients are the more likely to die; with other kinds of empyema younger people more easily succumb” (Prognostic XV///; Hippocrates II: 39-40)

Some of these developments can be explained with the function of the immune system. In a local infection or an abscession the immune system is still able to control the disease. If the local inflammation vanishes and general symptoms appear there is a breakdown of the first line of defence. Bacteria might produce metastases somewhere else or provoke sepsis, such as case VIII from *epidemics* (Hippocrates I: 233-234).

“The woman suffering from angina who laid sick in the house of Aristion began her complaint with indistinctness of speech. Tongue red, and grew parched.  
First day: Shivered, and grew hot.  
Third day: Rigor; acute fever; a reddish, hard swelling in the neck, extending to the breast on either side; extremities cold and livid, breathing elevated; drink returned through the nostrils – she could not swallow – stools and urine ceased.  
Fourth day: General exacerbation.  
Fifth day: Death.”

But the immune reaction is not enough to explain everything. The Hippocratic method is based on a hierarchical structure in which a teleological process takes place. This process can only be understood by introducing basic notions of general systems theory.

Centralisation: All rhythms of the body are hierarchically organized and not a bundle of unconnected rhythms of single cells and organs (Hildebrandt, 1998: 121). The hierarchy starts from the cellular level of clock genes, integrates all kind of inner and outer influences, such that a stable rhythm emerges (chap 4.7).

Goal orientation: The human organism tries to maintain its function in a changing environment. Describing the process of recovery in a teleological way implies that the

observed processes, here the inflammation, has to fulfil a task. Under this aspect it is not an accidental series of events caused by a bacterium or a virus. It is a purposeful action in order to re-establish or to maintain an inner balance.

*Equifinality*: A goal (here the goal of recovery) can be achieved in different ways, depending on the inner state of the system. The course of an inflammation is influenced by many factors such as the quality and quantity of the stimulus, the state of nutrition, the competence of the immune system and others. All this might alter the course. Unpredictable, though, the normal inflammation follows a certain pattern: it starts, achieves a peak and resolves, i.e., inflammation is effective and self limiting. Such cases are described by Hippocrates just with “*complete crisis*”, or “*perfect crisis*”. That is, in any kind of disturbance a certain rhythmic structure can be observed where complications might be encountered or overcome. If the time structure is missing, it is a bad sign – today mainly associated with chronic disease. In the light of these principles combined with the assumption that an organism tries to maintain the best equilibrium, what is called adaptation, the Hippocratic prognosis seems to be a meaningful tool.

Striking is that the Hippocratic principles are congruent with the so-called *Hering’s Rule* of homeopathy (Appendix VI). This rule provides an exact structure to judge individual processes. It is also in line with the principles of general systems theory. It is intriguing that with the background of Hering’s rule all Hippocratic cases become simple and intelligible.

That is, empirical medicine of different centuries found a similar way to describe processes and changes in an individual, giving clear instructions if and when an interventions are necessary.

#### **d) processual diagnosis**

Hippocratic thinking was processual. A diagnosis was the functional location in this process. What is with the balance? Is there coction? Where in the order of events are we?

Therefore, Hippocratic medicine attached no value to a diagnosis in a modern understanding (Hippocrates II: ix). Its interest was more in the ‘states’, what has been called “general pathology of morbid conditions” (Hippocrates II: x).

This is a general trait of systemic medicine, found in systemic psychotherapy, in homeopathy or in Chinese medicine, as well. In all these methods a diagnosis defines



the patient in a process according to an underlying theory. They are more concerned with the patient and less with the disease.

In Hippocrates' time it was the Cnidian school which attached importance to diagnosis. Hippocrates blamed them for multiplying types by assigning essential importance to accidental traits. Similar discussions on the value of the diagnoses accompany today every new issue of the Diagnostic and Statistical Manual of Mental Disorders (DSM) or a new key of the International Classification of Diseases (ICD).

### **e) changing the operator**

Was Hippocratic medicine effective? The simple answer is: we do not know.

Historians tend to be quite fatal, saying that prognosis was the only thing Hippocratic medicine had to offer (Lichtenthaler: 148). It has even been called “a meditation on death” (Asclepiades cited in Hippoc I: xviii)

The therapies mentioned by Hippocrates include herbal therapy, aromatherapy, local applications (*Regimen XX-XXIII*; Hippocrates II: 79-83), the correct administration of gruel (*Regimen XVI-XIX*; Hippocrates II: 75-79) and other dietetic measures. All that does not sound very impressive. But before judging, some important misunderstandings should be cleared.

The first major misunderstanding is that the many fatal cases reported by Hippocrates are due to his helplessness and that our medicine is effective in the control of infectious and acute disease. This misjudgement overestimates by far the effects of modern medicine. The epidemiological figures do not support such a view. Infectious disease is not less mortal due to medical treatment and the prognosis of polytraumatized persons seems not to be much better than in ancient times (chap. 2.2).

The second misunderstanding is that minor interventions have minor effects whereas major interventions have major effects. This trivial relation of dose and effect is, as has been demonstrated, only true if no positive or negative feedback mechanisms are induced. Of course, gruel has no special physiological effect, but if used to induce or change inner rhythms, the effect might be major. Also a glass of water, by drinking a sip of water every hour is said to be useful in infections (Kneipp 1954b: 92). Such a continuous stimulus might have a rhythmizing and therapeutic effect, far beyond our current models. The CHARM study including 7.599 patients with heart failure showed a decline of hospital admissions and early deaths when a drug is regularly taken. It made no difference whether it was a verum (Candesartan) or a placebo.

Regularity was the main beneficial factor (Granger et al 2004). As similar results have been found in a lot of trials (Simpson et al 2006) there is some probability that regularity induces inner rhythms. This “adherer effect”, as it is called today, is nothing else than a structural therapy (chap. 5.2.a).

Furthermore, when we assume that an inflammation has a certain goal, its development follows an equifinal order with a clear-cut proceeding. In such an order of events ‘minor’ interventions, such as cold or warm compresses, might, indeed, change some feedback-loops, that is, the operator. Actually, in hydrotherapy (chap. 5.4.c) there is a lot of knowledge how to change the inner reaction with such applications. This is in line with the observation of chronobiology that a stimulus according to inner rhythms supports the development, whereas interventions against inner rhythms are suppressed (Hildebrandt et al, 1986: 195). Minor interventions using the abilities of self-healing are theoretically as effective or more effective than strong interventions against them. Even chemotherapy in cancer is much more effective when it observes inner rhythms (Gorbacheva et al 2005).

In order to treat in line with inner rhythms it is necessary to use the right stimulus to the right time. For Hippocratic medicine timing was extremely important. Everything had to be done to the right time. Modern medicine does not pay attention to rhythms and timing is no issue, or if, it only concerns the metabolism of an administered drug. But in not using or violating inner rhythms the applied therapeutic means have to be so powerful that they overthrow the inner equifinal mechanisms.

As a conclusion it can be said that although there is no knowledge on the effectiveness of Hippocratic medicine, there is some evidence that by understanding inner rhythms and their teleological behaviour major changes might have been produced even through a small stimulus.

## **5.4 Balneology and the Beauty of Dignity**

*Issues of this chapter: specific and non-specific nature of therapy, no therapy without a frame, tailored therapy, good studies – bad medicine, experience, invalid research, therapeutic attitude, therapy by order, dignity as placebo, structural improvement of health, inner cleansing*

### **a) from pleasure to specific treatment**

Balneology is an empirical method without a concise system. It developed from the search of humans for health, wellness and fun. Thus, it was always associated with all

kinds of interests (Marcuse 1903). Vitruv, a Roman constructor shall have said that it is advisable to build temples near natural thermal springs as this increases the fame of the deity (Kisch 1883: 1). But it were mostly economic interests that shaped the business of balneology. People who pay have to be satisfied and supplied with anything. This was true for the religious centres of ancient times. This was true in the middle ages and Renaissance when cutters, cuppers and barbers provided a full service in cutting hairs, extracting teeth and caring for wounds. Baths lasted up to 6 hours with people eating, drinking and having all kind of fun in the bath (Kisch: 4; Marcuse: 76). It was the syphilis that led to the decline and the closure of the baths. Today, in the modern 'temples of wellness' the developments are quite similar. Everything is provided from hair cutting to botox injections.

This kind of balneology is more thought to please the customers and is less intended to have therapeutical effects. However, there have always been important medical centres associated with spas committed to a serious medicine. Today it is the association with primary and secondary rehabilitation that gives spas sometimes a high medical standard.

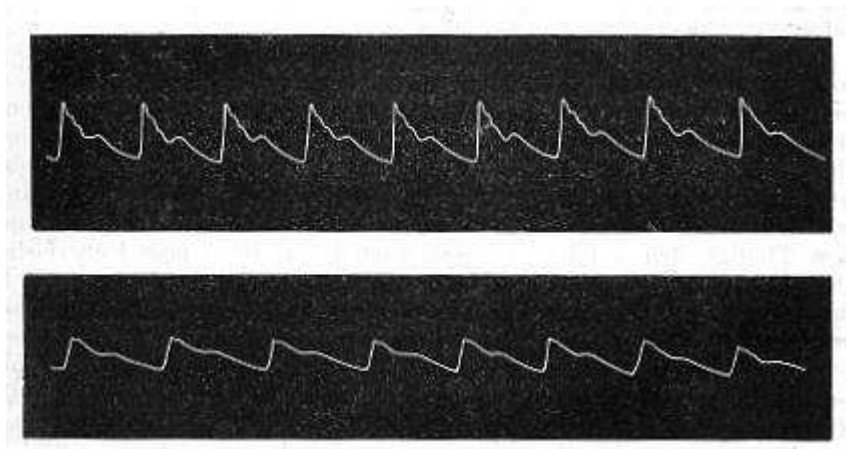
When a more scientific balneology developed by the beginning of the 19<sup>th</sup> century, the old habitudes were branded, especially the tendency to overdo things (Granichstaedten 1837: 95). New balneology was said to be totally different than the old one (Granichstaedten: 94). The top priority was the understanding of the therapeutic means and their 'specific' healing factors (Kisch: 30). Springs were no longer seen as panacea but were connected with certain indications.

A scientific definition, still valid today, was established: *Balneology is an immersion of the body or parts of the body in an airy, liquid, semi liquid or solid milieu* (Debay, 1893: 15).

Around 1870 measurements became ever more important. The constituents of the therapeutic means were analysed and quantified, e.g., the minerals of drinking waters, the temperature and the ingredients of baths, as well as the physiological reaction of the body. This new knowledge was compared with the pathological concepts of the time and set in relation to the empirical knowledge (Kisch).

Here an illustration (about 1880) demonstrating the change of the pulse curve after drinking of 300cc water (46 °C) showing that it has a greater impact on pulse curve (above) than drinking cold water (below) that left the pulse curve unchanged (Kisch:

29). The opposite had been expected as cold water is said to have a stronger impact on physiology.



But there was (and is) an underlying problem with all these data (actually, it is the practitioner's paradox). A therapy in a spa is not the use of some defined therapeutic means, but a complex method (Kisch: 25). Sometimes three or more different types of therapy are combined in the regimen. Even in spas with only one therapy, let's say drinking from a spring, many factors determine the outcome and have to be considered: climate, motion, diet, frequency of drinking. It makes a difference if twice a day a larger quantity has to be drunk or several times a small quantity, whether the spring is in the centre of the spa or in the woods. The right application and combination of the therapeutic means for a given patient depends extremely on the experience of the physician.

The mere analysis of the spring water and the knowledge of its physiological impact gives no hint how to use it. The analysis of the springs of Marienbad (Thilenius 1882: 469) hardly explains the effects of a therapy in Marienbad.

	Kreuz- brunnen	Ferdi- nands- brunnen	Wald- quelle	Carolinen- quelle	Ambro- sius- brunnen	Rudolfs- quelle
Schwefels. Natron ..	4,9951	5,0477	1,0616	0,3627	0,1889	0,1504
Schwefels. Kali. ....	0,0522	0,0423	0,1947	0,0015	Spur	—
Doppelt kohlensaures Natron .....	1,6628	1,8228	1,4138	0,2557	0,0959	0,0584
Doppelt kohlensaures Kali .....	0,0074	0,0143	0,0085	0,0005	Spur	—
Doppelt kohlensaurer Kalk .....	0,7481	0,7839	0,5490	0,4501	0,2424	1,6075
Doppelt kohlensaurer Strontian .....	0,0010	0,0009	—	—	—	—
Doppelt kohlensaure Magnesia .....	0,6612	0,6899	0,5974	0,1816	0,1104	0,1404
Doppelt kohlensaures Eisenoxydul .....	0,0484	0,0849	0,0246	0,0403	0,0440	0,0572
Doppelt kohlensaures Manganoxydul ...	0,0042	0,0216	—	0,0036	0,0029	0,0102
Chlornatrium .....	1,7011	2,0047	0,3673	0,1098	0,0499	0,1966
Phosphorsaurer Kalk	0,0018	0,0019	0,0096	0,1560	0,0013	—
Phosphorsaure Thon- erde .....	0,0049	0,0017	—	—	—	0,0340
Kieselsäure .....	0,0820	0,0964	0,1013	0,0699	0,0470	0,0125
Organische Substanz	1,1791	Spur	—	0,0015	0,0234	—
Summa	11,1073	10,6130	4,3278	1,4928	0,8061	3,2142
Freie Kohlensäure in Cem. ....	552	1127	553	1231	1198	—
Temperaturen ....	+ 11,8° C.	+ 9° C.	+ 10° C.	+ 9° C.	+ 9° C.	+ 10,5° C.

From the ‘specific’ point of view each factor beyond this analysis can be seen as ‘frame’ factors in which the defined therapy (drinking the water) happens. Until the end of the 19<sup>th</sup> century textbooks on balneology regarded these ‘frame’ conditions as a medical issue. Even the best way to reach the spa, or the clothing were considered (Thilenius 1882). In contrast, current balneological research lays mainly emphasis onto the specific factors. But as the specific intervention is only a part of a wider regimen, modern research is caught in a sort of a dilemma concerning effectiveness and specificity.

In fact, the very distinction between ‘specific’ and ‘unspecific’ becomes doubtful. Taken strictly, everything else than the minerals and the temperature of the springs of Marienbad are placebo effects.

Here are some results of modern balneological research concerned with the question how a certain therapy is specifically effective:

- Baths containing high concentrations of CO<sub>2</sub> can be applied in quite low temperatures without the impression of being cold. It can be measured that in CO<sub>2</sub> containing baths microcirculation is about double as high, whereas bathing in normal water reduces microcirculation to the half. The results correspond to the subjective feeling of cold, absent in CO<sub>2</sub> baths (Karagülle et al 2004).

- Walking on a sandy beach is associated with a high physical strain not seen by walking on firm ground (Stick/Mende 2002).
- Davos has always been an important spa for climate therapy. Its main indication was tuberculosis. Today it changed more to atopic disease (bronchial asthma and neurodermitis). In such patients a decrease of eosinophilic granulocytes and a normalisation of T-cell activation can be seen after 3-4 weeks (Simon/Borelli 2001).

Such results do not create new knowledge, but they quantify well known observations according to certain surrogate parameters. One of these parameters is microcirculation influenced by such different therapies as the administration of warm applications (Berliner et al 2002), electrotherapy (Mucha 2001) or CO<sub>2</sub> baths.

However, such parameters do not reflect how the different therapies work, nor is microcirculation able to explain the different impact warm applications, electrotherapy or CO<sub>2</sub> baths have. Nor do they enable to compare the therapies. Such parameters are too restricted to represent the whole range of influences a therapeutic stimulus can have on humans. They only provide some additional data to empirical knowledge.

Studies might help in doubtful situations. It has been found that warm baths with peloids (Moorsuspensionsbad) with a medium temperature (37° C) induces no further cardiovascular stress and can be applied to patients with a cardiovascular history (Crevenna et al 2003). Such patients had been excluded from this therapy before. That is, the more specific the disease to be treated, the more information provides this kind of research. The rehabilitation and secondary prevention of cardiovascular patients, for example, has improved a lot through balneological therapies (McAlister et al 2001; Stofft et al 2001, Gutenbrunner et al 2002).

This kind of balneological research fits to a medical concept based on specifics: The rehabilitation after a specific disease can be best conceptualised with specific interventions connected with an early detection of pathological changes (Makover/Ebrahim 2005). But this does not mean that it is the best treatment. It only says that in this self-referential circle of therapy and prove no other things are observed by definition. But doing so the epistemological problem does not vanish. This becomes clearer when the concept of *hardening*, the attempt to attain robustness, is introduced (chap. 6.6). Actually hardening has long been the main request for balneology. Its benefits have been well known over centuries. It can be attained in many ways and can heal or prevent diseases of all kind. The name of the disease is not

important (Granichstaedten: 150). It is a phenomenon of organization. This is why it creates methodological problems on the level of simple measurements.

Of course hardening has physiological effects. It might boost cell mediated Th1 immune reaction and enhance the number of T cells (Kreutzfeldt et al 2003). This is especially true for therapies that induce stress reactions, whereas mainly passive therapies like massage lead only to a temporary reaction (Kreutzfeld/Müller 2001). But this immunological reaction is not specific for hardening. Also amateur choir singing (in contrary to only listening) is able to modulate the immune system and has additional effects, e.g., harmonizing cortisol levels (Kreutz et al 2004). Choir singing has actually a multitude of physiological effects. At the annual Congress for Psychotherapy in Lindau (Lindauer Psychotherapietage) the first session was always music. During one week it was choir singing and during the other week it was listening to music. The difference of mood and feelings was impressive (at least to my not validated observation).

It is somehow difficult or even impossible to define the 'specific' effect of choir singing. It has a similar equifinal status as playing (chap. 4.7). Every attempt to nail down one factor leads to somehow doubtful results. Social integration is an important factor in choir singing and social integration improves fibrinogen levels (Loucks et al 2005). Probably nobody would expect that the impact of social communication is sufficiently described in measuring the surrogate parameter of fibrinogen levels. Similarly is laughter an effective remedy (Canisius College 2008), even in chronic disease (Cousins 1985; 1990). But who wants to distinguish the categories of singing, laughing and social communication from each other?

Out of therapeutic reasons it even makes sense to combine such different techniques as bathing, singing and physiotherapy. All these unspecific methods improve health through the same, similar or different pathways. May be the concept of Renaissance has not been as bad after all?

But when different methods are combined it is more difficult to conduct trails, although there have been attempts to do so. Patients with knee osteoarthritis were treated for eight days in a spa hotel. Group I had a thermal water bath and a peloid bath a day, group II had two thermal water baths a day. Both regimens improved significantly function status and pain, however the improvements were significantly higher in group I (Odabaşı 2002). Although this study has many methodological problems, e.g., too few participants and a too short duration, its main problem is not a

statistical but a methodological. This study was designed against all principles of balneology, naturopathy or systemic medicine. A stimulus has to be tailored. It has to be adequate for the situation of the patient in regard of his possibilities, resources and interests. To observe this is good for the therapy and for the patients. But it is bad for studies.

The prescription of a regimen does not depend on the knowledge of the physiological effects of the therapeutic means. Contrarily, this is often of minor importance for a balneologist. He has to be experienced, he must have seen different courses to understand reactional patterns.

Patients with long standing fatigue might be prescribed a bath of rosemary which has a stimulating effect or a bath of valerian which has a sedative effect. The first is preferred in more depressive states, the second in exhaustion after long standing physical or mental stress. This decision is irrespective of the diagnosis the patient is labelled with. It might be back pain, arthritis, hypertension, Crohn's disease or something else. The individual has to be understood, not only the conditions of the specific disease. "Individualisation is the main task of a balneologist and of every practitioner" (Kisch: 339).

Empirical knowledge is gained through self-experience. The German education for balneology comprises a lot of self-experience. Only by that the observations in the patient and the reports of the patient can be judged and correlated correctly.

Unfortunately many balneological clinics are not run by educated balneologists but by scientists and neither the senior consultant nor the assistants have any personal experience with the therapeutic means they use. However, they contribute to the scientific knowledge of balneology.

The old complaint that doctors make everything wrong as they do not have enough knowledge, give too many remedies in the course of the regimen, leave patients in 'bad air', and look more for their own comfort (Anonymous 1837: 53-59) is still partly true today.

Despite the schematic regimen, often prescribed by therapists, there is another sort of individualization in balneology, mostly overlooked. Helpers and physiotherapists in accordance with the patients change often fundamentally the regimen without the knowledge of the doctor in charge. The less the doctor individualizes the higher is the possibility that the actual therapy does not resemble the prescriptions. It takes a very



familiar relation with the patient, the physiotherapists and the helpers to be informed what really happens.

All this alters the results of scientific research which depends on surrogate parameters. I suppose that even in drug trials the environment of the patient will strongly influence the outcome of the trial by 'unspecific' interventions, particularly, when the results tend to be negative. As balneology is characterized by more 'unspecific' factors, this is why this trait is here more prominent.

### **b) beauty and dignity – the 'placebo' of human values**

There are many 'unspecific' factors in balneology. One of them is architecture. Whoever visited one of the old spas and wandered around the parks, went into the spacey marbled receptions, had treatment in old bathrooms or just sat in a well organized garden made the experience how relaxing this kind of architecture is. Beauty and aesthetics characterized the spas from Ancient times. They were a major and cheap therapeutic factor (Kovarik 1985). Just as good manners are (Kahn 2008). Beauty is helpful in pain reduction (Tomasso et al 2008) and could also be beneficial in the hospital treatment (Major 2008).

But today, in contrast, physiotherapy has to be absolved as a scientific program in a functional atmosphere. In therapies the patients lie for half an hour or more in an often ugly room, looking at cold neon lamps, behind chequered metals which, although clean, always give the impression of something worn out. Today's architecture often neglects the basic needs of humans for aesthetics. Although the measurement of the body functions are precise, a lot of good by such a knowledge is countered by an unattractive environment. It would be a misunderstanding of human nature to see such effects as irrelevant.

Granichstaedten (142- 145) describes two patients, one receiving the traditional therapy for syphilis at his time (first half of 19<sup>th</sup> century), the other one had hydrotherapy in a spa:

*The patient with the traditional therapy* vegetates in closed rooms, has a rigid diet developing a disgust for all meals, spending the days with a feeling of unease and depression. The nights are sleepless. Through the therapy his teeth become loose and the taste in his mouth is foetid. This is the state how he is released

*The patient with hydrotherapy* lives in fresh air with an increasing appetite. Although he is (mis)treated with cold water during the days, he will develop trust into the

therapy. His good and deep sleep is disturbed in the morning with treatments leading him to sweat, but afterwards he will climb in the mountains, drinking fresh spring water. He will suffer crises, but he will get better. At the end of the therapy he will have eruptions all over the body but he will be strong and on the way to health. This is how he is released.

Although this is pure propaganda, many of the points (fresh air, food, exercise, side effects of the therapy and general attitude) are still true today. To some extent hospital therapy has not changed too much. But balneology made some steps towards hospitalisation.

The most important difference between the two examples is – according to Granichstaedten – the ‘moral feeling’ (Granichstaedten: 148), the attitude of the therapist and the atmosphere of the whole environment. Today’s attitude is to solve all problems by drugs and therapeutical interventions. Therefore, it is no surprise that physicians and patients prefer passive therapies (Osthus/Jacobi 2002), which are – as seen before – less effective.

Balneology is one of the few branches in medicine having a different attitude than the mainstream medicine. Hardening and active exercise are most important features. But balneology also aims at changing the life style. This has been called *Ordnungstherapie* (therapy by order), a term introduced by Bircher-Benner.

‘Therapy by order’ helps to reinstall inner rhythms by a proper conduct of life. It might include such simple procedures like eating in family style of nursing home residents (Njis et al 2006). But it also includes the spiritual aspects of a therapy. Such issues are not only neglected in current medicine (Hammer 1990: 45). My be they are even as suppressed as sexual problems at the time of Freud. That is, a therapist using techniques of ‘therapy of order’ has to face questions of life for himself. It requires a stance on issues like suffering, death, happiness and so on (Brüggemann 1980). It requires an attitude (chap 6.14). What other sense has a therapy than to live ones own life (Hammer: 59)? Therefore, one of the most important qualities in the ‘therapy of order’ is dignity, dignity of the patient, dignity of the team and dignity of the individual doctor.

One of the main shortcomings of the reductionist approach is that it defines basic human values like beauty, respect and dignity as placebos. They have been abandoned by science despite their importance for life and therapy (Marmot 2003), despite their importance for medical practice (Leibold et al 2003).

### c) hydrotherapy as structural intervention

It is no surprise that the major influences to balneology came not from doctors but from outsiders, not obliged to the medical paradigm. Outstanding in their influence were:

Vinzenz Preßnitz (1799-1851), a German farmer observed how traumatised animals took cold baths. In self experience he confirmed this observation. He started to treat neighbours. The interest in his method increased, and finally his whole village became a kind of a spa. Without any physiological knowledge, only attributed with a good observation he introduced a system of applying cold compresses in order to induce sweating. His applications became a kind of a standard therapy in folk medicine in Germany until after WWII. It was mainly used in traumata, infectious disease, and to some extent in chronic disease. His system seems to show some similarities to the Hippocratic treatments.

Sebastian Kneipp (1821-1897) a German catholic priest suffered from tuberculosis that ruined his health. After having read an old book on hydrotherapy, he took winter baths in the Danube. By that he recovered. After treating friends and neighbours his name and fame spread. In his later years he founded the spa of Bad Wörrishofen that continues until today his work. In recent years scientific research supports most of his therapies. Hydrotherapy was the basic of Kneipp's treatments, but he used phytotherapy, physiotherapy and diet as well.

Although Kneipp was very successful, doctors were not interested in his work (Kneipp 1954b: 21). He was not only ignored but also brought to court by some physicians. It was only after his death that his work was partly adapted by mainstream medicine. But it was mainly kept alive in Germany by a strong public movement of patients (Kneipp-Vereine).

Kneipp was always an opponent of a standardized procedure. "Here I have to say that I do not approve the current sanatoria for hydrotherapy, sometimes I empathically disapprove them. They seem to be much too strong and – sorry for the expression – too one sided. Far too much is tarred with the same brush, and in my opinion too little the patients are distinguished, their more or less weakness, how deeply rooted the disease is and how more or less advanced the disease is with all its consequences. Exactly in this ability, in the diversity of applications and in the diversity to apply them to the individual patients mastery

is proved“ (Kneipp 1954a: 19, my translation). He found best results when water was used in its simplest and mildest form (Kneipp 1954a: 20).

For Kneipp, the lack of robustness was the main reason for chronic disease (Kneipp 1954a: 23). Robustness and responsiveness are improved through exercise and applications inducing physiological processes, not by compensating a lack of reaction. One case report of Kneipp was the case of a boy continuously losing sight. Finally he hardly found his way when walking. Kneipp observed that the boy was generally in a bad condition. The aim of his prescriptions (baths and washings of different kind, for the whole body, for parts of the body and for the eyes) was to improve the health condition in general. After 7 weeks the boy regained normal sight and was in a better health, as well (Kneipp 1954b: 165-167).<sup>16</sup>

This case exemplifies that hydrotherapy uses a structural approach. It tries to influence the health on an organizational, on a second order level. Robustness (chap. 6.4) has to be increased. The actual symptom is not prior-ranking.

#### **d) inner cleansing and the experimental setting**

Preißnitz and Kneipp followed the humoural concepts of Middle Ages and the beginning of Renaissance. Except of hardening (which was no issue of the orthodox medicine then and is no issue of the orthodox medicine now) the aim of Kneipp's therapy was to dissolve and to secrete (Kneipp 1954a: 27). Kneipp describes a case of asthma where after the first water applications the urine of the patient became opaque, thick and 'dirty', just 'like an inner abscession had opened'. Every day more urine and more 'dirty' urine was excreted. After four days the asthma became better (Kneipp 1954b: 160).

Granichstaedten a medical doctor and student of Preißnitz describes secretions over the skin. He wrote: "A form of eruptions, the so called bathing rash or miliary herpes, occurs most often and is a good sign for the effectiveness of the water to secrete pathological substances". He saw this rash mostly after the third bath. The day before, the patient was uneasy and the feeling vanished with the outbreak of the rash (Granichstaedten: 136, my translation). Also he saw ulcers the size of a pea (sometimes larger) with a red halo, more or less painful (Granichstaedten: 136-137). A late form of such an excretion was an abscession appearing after some months

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<sup>16</sup> This is in line with the concepts *bioenergetics*. To improve seeing exercises focus mainly on the relaxation and adaptability of the whole body and less on the eyes (Scholl 1978).

which might last for several weeks. This was a very painful process accompanied by a swelling of hands and legs. He understood this skin reaction as a result of earlier drug therapies (Granichstaedten: 137-138). That is, by these eruptions the body wants to get rid of old drugs.

The idea of a secretion and an inner cleansing sounds strange to modern doctors. Kneipp's asthma case can be seen as accidental. The early eruptions described by Granichstaedten could be a reaction to an overstimulation, as well. Today it would be probably qualified as a kind of allergic reaction. The eruptions months away from a stimulus will today not be attributed to the stimulus.

But as already seen with Hippocrates' rhythms one should be careful to dismiss such observations as fantasies. Secretion is not only an important issue in the Hippocratic tradition. Different methods of CAM observe it, as well, speaking of an 'inner cleansing' and there is some evidence, supporting this concept.

Fasting is a therapy of CAM claiming to have many positive effects. This claim finds some support of orthodox medicine lately (Kuchroo/Nicholason 2003). The newly presented explanation that the effect of fasting is due to the influence on leptin regulating inflammatory and immune response and directly effects T cells, sounds interesting. But it is not the main factor, for sure. Fasting doctors always propagated an inner cleansing what has caused a lot of fun among orthodox physicians.

In the course of a fasting therapy many people utter that they have a bad taste. When asked, some older patients say: "Oh, yeah, it is the taste of tetracycline!". It cannot be proved in such cases that it is a disposal of an old substance, a remnant of an earlier disease or therapy that is excreted. But there is some probability that by fasting old and subacute inflammations and/or deposits of old drugs or chemical substances are dissolved.

To confirm this I would like to refer two examples of an 'inner cleansing':

1) Lützner was one of the leading figures of the fasting therapy in the last decades (Lützner 2000). He saw a case where a patient after two weeks of fasting developed a black coating on her tongue which smelled like shoe cream. The coating remained for two days. Asked about, she admitted to have worked in a shoe factory about twenty years before. The CAM interpretation is that she excavated an old substances still present in her body (Lützner, personal communication).

2) I had a patient, a twenty year old girl who had to give up her profession as hairdresser because of allergic reactions (asthma and eczema). A few years later, at

the time of the treatment, she suffered from rare nightly asthmatic crises (ever 6-12 months), but had quite often eczematic rashes on her hands and a contact allergy for imitated jewellery. One day after taking a homeopathic drug nearly the whole face was covered with a rash. The ears had about the double size. Especially the earlobes were swollen. (She said that she regularly used cheap earrings and to avoid eczema she put on a cortisone cream before.) This rash lasted for several weeks. The most interesting part was that after some days she developed some cysts at the occiput at the margin of the hair. These cysts opened and secreted for several days a fluid smelling exactly like the substances she had worked with as a hairdresser. After the treatment her allergy had improved considerably

These two observations pose a methodological problem. They are made in retrospective. Normally such retrospective causalisations are defined as accidental, what seems a little bit difficult in these cases. But, it is true, such reactions can never be predicted prospectively. A trial on shoe workers investigating the excretion of shoe cream through fasting would provide only negative results.

## **5.5 Homeopathy – Observation and Research in Chronic Disease**

*Issues of this chapter:* paradox pharmacology, concept of chronic diseases with the example of atopic disease

No method of CAM is more controversially discussed than homeopathy. Critics agree that nearly all principles of homeopathy are unscientific. Homeopathy is called irrational, charlatanry, sect, cult and other (Jarvis 1994). The remedies homeopathy uses are the main obstacle for taking this method seriously. They are made of different minerals (sulphur, phosphorus, silicate), extractions of plants, animals (bee, poison of snakes) or products of pathological processes (carcinoma, tubercle). Out of these substances an alcoholic ‘mother tincture’ is produced. The mother tincture is diluted several times in a relation 1 – 10 (D - potency) or 1 – 100 (C – potency). With each step of dilution the container of the tincture is vigorously shaken, traditionally tapped on a leather book. Today this is mostly done by machines. This process is called potentiation or dynamization.

The *Law of Infinitesimals* – which is actually no law but a guide line - says that the dynamization eliminates the side effects but not the effectiveness. The process is said even to raise the therapeutic power. Homeopaths are not one opinion how often this process of dynamization should be repeated. The most commonly used potencies are

C6, C12, C30, C200, C1000. The main point of critic is that a potency of C 12 with a dilution of  $10^{-24}$  is identical with Avogadro's number and that potencies like C200 ( $10^{-400}$ ), C 1000 ( $10^{-2000}$ ) exceed it by far.

There is not the slightest explanation how such a diluted substance might work. A lot of models had been proposed based on energies or waves (Kratky 2003), or quantum mechanics (Walach 2003), but nothing is only partly convincing.

Some argue that by the process of dynamization the molecular structure of the water might be changed. Such an article of Beneviste in *Nature* (Davenas et al 1988) caused quite a stir, but was retracted later as an investigation of Beneviste's laboratories showed irregularities and other groups were not able to confirm his experiments (Kaufmann 1994). Although further research showed recently that clusters of molecules in a solution of water clump together if water is added (Coghlan 2001b), and that hydrogen bonds in pure water are very different from that in homeopathic dilutions of salt solutions (Milgrom 2003), this does not explain how homeopathy works as also triturations of a substance in lactulosis (mercury) are used. Even the smelling of the remedy is said to have a therapeutic effect.

Most of the other reproaches against homeopathy, however, are not as justified. A main accusation is that homeopathy rejects a linear relationship between dose and effect (Seymour 2001). But as demonstrated before, this relationship is a special case only true in a small physiological range (chap. 4.11). It is no longer true when it comes to inner regulation.

Another accusation concerns the *Law of Similia*. It is the basis of the homeopathic treatment and gave the name to the method: *homeo* (similar) and *pathos* (suffering). It says that a remedy is able to cure a disease with certain symptoms if it provokes the same symptoms in a healthy person. A classical example is *Atropa belladonna* which – in poisoning – provokes fever, flushed face, enlarged pupils and excitement. Such symptoms are often seen in infections of early childhood. In these cases *Atropa belladonna* is given as a remedy. Furthermore, the rash of Belladonna poisoning resemble scarlet fever. Hahnemann (1755-1843), the founder of homeopathy, is said to have had good effects with this treatment (Haehl I 1922: 61).

The usual idea is that “the homeopathic Law of Similia ... is unsupported by the basic sciences of physiology, pharmacology and pathology“ (Jarvis 1994). But there is a lot of evidence demonstrating that the principle of the Law of Similia is more prevalent than expected. Strategic systemic psychotherapy developed models for

paradox reactions based on the understanding of cybernetic cycles (chap.4.4), models representing definitely clinical observations. Reactions following the homeopathic pattern are called *paradoxical pharmacology* (Martindale 2003). Sleeping pills (zolpidem) have activated and aroused coma patients (Clauss/Nell 2006). Beta-blockers are successfully used in congestive heart failure (Martindale 2003) or asthma (Nguyen et al. 2008), although the theory regards them as an absolute contraindication. But the best known example is the use of stimulants in hyperactivity disorder (Marcovitch 2004).

At first, these are mere individual, insular observations. The principle as such has been studied more in detail under the name *hormesis*, a biphasic dose–response phenomenon characterized by a low-dose stimulation and a high-dose inhibition (chap. 6.10). The applicability of the hormetic principle is known since the 1880s. But it had been excluded from the scientific frame then, in order to prevent homeopathy of claiming an effectiveness (Calabrese 2008). And still today, scientists doing research on hormesis are anxious not to be associated with homeopathy (Calabrese/Jonas 2010).

All this does not add anything new to the analysis of the medical method. From the theoretical point of view homeopathy is just another ‘strategic therapy’ (chap. 5.2.b). What is interesting about homeopathy in this frame of investigation is its concept of diseases, especially of chronic diseases. We will see that such a meta-model is not only necessary to overcome the autistic-undisciplined thinking, but that the now emerging model of chronic diseases has a lot of similarities with the homeopathic model. What interests here is the homeopathic concept of disease, especially of chronic diseases. It is a dynamic model with a lot of similarities to the now emerging model of chronic diseases based on recent immunological discoveries. As this model relies on the clinical observation, it is independent from the questions whether or not homeopathy is a placebo therapy.

#### **a) chronic disease and miasms**

Towards 1835 Hahnemann described two kinds of diseases. The first, the acute disease, is a simple disturbance of regulation. It is self-limiting, leads to death, to a residual state or to complete recovery. The second kind of disease, the chronic disease, has never the tendency to become better spontaneously, even if it vanishes for a while. On the occasion of another disease or a mental stress it ‘awakens’ again and



continues its development (Hahnemann 1835: 62). The disease is not bound to certain characteristic symptoms. It is more a continuing decline of vitality in different forms. In such a disease the first interventions might be helpful, but therapies become less effective each time (Hahnemann 1835: 4). Hahnemann called these chronic states *miasms* meaning something like "taint" or "contamination".

His concept of chronic disease says in short that

- all chronic disease is contagious,
- starts with a representation on the skin,
- spreads if the first signs are suppressed,
- acquired chronic diseases can be inherited

The first point, the infectious origin of chronic diseases, became a central topic lately under the header of 'germ theory' (chap. 4.3). Also the fourth point, the importance of epigenetics for health and diseases is slowly acknowledged (chap. 4.3). The importance of the third point, the concept of suppression will later be discussed in detail (chap. 6.8). Only Hahnemann's second point, the skin representation, is not supported by current knowledge. In any case, it would be misleading to try to translate Hahnemann's concept 1:1 into modern terms. In order to understand whether and/or in how far older observations are reasonable for a better medical epistemology, the whole context has to be analysed appropriately.

The homeopathic paradigm for a chronic disease is syphilis. As already mentioned (chap. 2.2), Hahnemann maintained that during his more than 50 years of practice he never saw syphilis stadium II or III if the initial lesion, the chancre remains untouched. On the other side the chancre has no tendency to go away spontaneously and might even last for years (Hahnemann 1835: 110). He saw the main cause for the progression of the disease in the local 'treatments' of the chancre. Disturbing the local equilibrium, as we would say today, was in his opinion disastrous. Even cutting the chancre off, sometimes performed in his time, never prevented the further progression of syphilis (Hahnemann 1835: 120). It might be theorized that the chancre represents a local mechanism of the immune system, a first line of defence against the invading *Treponaemae*, such that its disturbance of this first line of defence leads to the spread of the germs. Although this is a decidable question, it is of no further relevance in times of an effective antibiotic therapy.

The more general question as important as to Hahnemann's times is, in how far a local treatment of a disease might lead to its chronification. There are a lot of

examples supporting this view. The interference with inner rhythms (chap. 5.3.b) has been cited earlier, also the example of the identified patient maintaining the balance of the family (chap. 5.2). Others will be discussed later (chap. 6.8). Again, systemic psychotherapy provided a related meta - theory demonstrating how the interference with local symptoms might lead to the decline of the stability of the whole system (family). These principles are, to a certain extent, applicable to the human regulation in general.

#### **b) atopic disease and psora**

Another chronic disease described by Hahnemann is the so called *psora*. It has a short incubation time of 1-2 weeks, starts with fever as in a cold, shows eczematic eruptions and has the tendency to cause later a generalized disturbance (Hahnemann 1835: 50). In contrast to syphilis, *psora* has spontaneously the tendency to become chronic. No suppression of the skin lesions is necessary, although this might promote the chronification. The cases Hahnemann described for *psora* (Hahnemann, 1835: 22-24) are mostly identical with what is called today *atopic disease*.

In modern terms atopic disease starts mainly with dermatitis. Children having atopic skin alterations will later develop allergic rhinitis or asthma with a 80% probability (Leung/Bieber 2003), the so called 'atopic march' (Demehri et al 2009). A connection of atopic dermatitis with fever has not been observed in orthodox medicine, but the incidence of atopic disease rises with the incidence of childhood infections (Benn et al. 2004).

Theoretically, there is a multitude of causes for the atopic disease. The genes attributed to asthma are, among others, ADAM 33 (Shapiro/Owen 2002), ADRB2 (Ridley 2000), DPP10 (Allen et al 2003). Also the silent congenital infection with *Ureaplasma urealyticum* has been claimed as its cause (Day 1997), but is probably only one germ in a whole spectrum.

The use of antibiotics in the first year of life has been accused for the rise of asthma and other allergic diseases, as well (Bach 2002; Dotinga 2003, Motluk 2003; Randerson 2004; Noverr et al 2004a), denied by others (Benn et al 2004).

Fever has been seen as protective (Williams et al 2004), or as harmful (Benn et al 2004).

The prevalence of house dust mite shall be causal (Sears et al 2003). But measurements of house dust mite in the environment of newborns cannot predict asthma (Martinez 2003).

Endotoxin, found, e.g., in the faecal flora of larger mammals is associated with wheezing during the first year of life, even at low doses. But in animal models and in studies in humans, exposure to endotoxin in early life, during the development of the immune system, seems to prevent the development of allergic disease (Weiss 2002). However, cleanness protects if the disease is present (Morgan et al 2004). Pollution was accused (Gauderman et al 2004). But Athens, Greece, long had a relatively low asthma incidence, despite its high levels of air pollution (Bach 2002). Asthma was also quite low in former Eastern Germany, despite a horrible pollution. But asthma rose to Western levels after reunion, although pollution declined (Schlaud et al. 2007).

Another explanation are the preservatives, stabilisators, colourings etc. of Western food industry, also discussed for the development of ADHD (Eigenmann/ Haenggeli 2004). Even global warming was attributed to the rise of asthma (Ault 2004).

“Welcome to pleiotropy and pluralism. Your looks are affected not by a single "looks" gene but by lots of them – and by nongenetic factors as well, with fashion and free will figuring prominently among them.... Nearly every statement we might care to make about asthma can be challenged, including the assertion that it is getting worse” (Ridley 2000).

Indeed, a look at the scientific news service of *www.wissenschaft.de* covering only one year (accessed 4.3.02) shows such confusing results as: Bacteria ameliorate (30.10.01), or worsen (12.6.02) or are causal (14.6.01), bovine tuberculosis ameliorates (28.2.02), cats worsen (6.7.02), or not (14.3.01), dogs ameliorate (6.11.01), gas cookers worsen (14.8.01), passive smoking worsens (27.9.01), margarine and fried food worsens (20.7.01), harmonic families ameliorate (5.7.01), but asthmatic children strengthen the family (23.3.01), etc. Up to 68% of the cases are caused genetically (23.10.01), something that does not explain the rise of asthma in children of 33% in the German town of Munster in the years from 1995 to 2000 (13.6.01), or only if one assumes that these are all the not genetically caused cases. Epidemiological studies differ from a 20 % incidence in British isles with a falling tendency (Anderson et al 2004) to over 60% incidence in Aberdeen with a rising tendency (Devenny et al 2004). This might be due to different definitions or to special local conditions (Rees 2005), or to the observed population (Zauli et al. 2005). The general trend seems to be that asthma rises with the adaptation of a Western living style remaining then on a high level (Asher et al 2006).

The comparison of results is often difficult as it is not always obvious whether they refer to atopic disease, asthma or allergy. These different terms represent often more a certain approach of the observer leading to different categories than distinct diseases (Wenzel 2006). However, there is a major difference between eosinophilic (atopic) asthma and non atopic asthma in children. Whereas atopic asthma has the tendency to become worse (and thus represents a chronic disease as defined by Hahnemann), children with non atopic asthma lose their symptoms over school age (Illi et al 2006). This typical autistic-undisciplined picture is due to the nonlinear nature of atopic disease and asthma which is a network pathology with a predominance of Th2 helper cells (chap. 6.3).

### **c) atopic disease and inflammation**

Atopic disease is characterized by inflammation. This inflammation is mainly IgE-induced. According to linear assumptions IgE was a long time considered as the cause of atopic disease, but IgE deficient mice can become allergic, as well (Mehlhope et al 1997). As seen before, the search for causes is often futile in nonlinear systems. A study of the pattern might be much more promising.

Atopic disease concerns two main organs, the skin and the lungs. Although the inflammatory process is maintained by different cells in the two organs - mast cells in asthma, Langerhans cells in atopic eczema (Leung/Bieber 2003, Kaplan et al. 2005), there is a comparable pattern. Two components seem to be crucial for the development of the atopic disease, a slow and a quick factor, although there is only little knowledge about these two different rhythms for the skin (Leung/Bieber 2003). The situation is better in asthma. The quick regulative inflammation is triggered by animal fur, pollen, cigarette smoke or house dust mite faeces (Brown 2004). The slow process involves the thickening of the smooth muscle that might become about three or four times as thick and contains many mast cells (Brightling et al 2002). This thickening is a long term process (Shore 2004) which does not correlate with the amount of inflammation in the airways (Brown 2004). It is a structural abnormality of the so-called *remodelling process*. As asthma progresses, the chronic inflammation leads to a further remodelling. But although inflammation and the remodelling process influence each other reciprocally, the two mechanisms are somehow separate (Brown 2004, Holgate/Polosa 2006).

What we see here is a regulative process on two different levels

- a quick positive feedback mechanism of mediator cascades leading to an asthma attack
- a long term, structural process based on a slow positive feedback leading to thickened smooth muscle with a higher density of mast cells.

These two layers of disease are about what Hahnemann described with his concept of chronic disease. The quick mechanism which can be influenced quite easily is more definite and precise. The slow mechanism which remains untouched by specific therapies, worsens with time and leads to a continuous decline of health and vitality. Exactly this can be observed in steroid therapy. It is effective in suppressing inflammation and reducing the frequency of asthma attacks, but makes no long-term difference to how well people's lungs work (Brown 2004, Guilbert et al 2006, Murray et al 2006, American Thoracic Society 2007).

Moreover, the quick cascade mechanism that provokes symptoms gives not necessarily a hint onto the development of the underlying chronic disease. It could be shown that asthma (or better the chronic process) starts quite early in life. It might remain silent for some time and can reoccur after long periods of absence (Sears et al 2003). Those who had consistently low peak flow measures at ages 18 and 26 had already had a low peak flow by the age 9 (Rasmussen et al 2002). That is, early alterations remain over decades without symptoms and without 'disease-value'. The chronic process continues, despite short term incidences of worsening or amelioration. This is a very simple pattern. The factual process is probably much more complex. But already this plain model shows how systemic tools might be used to come to new conclusion and hypotheses which might eventually lead to a different understanding of the development of the atopic disease in special and of chronic diseases in general. Such conclusions might be:

First, there are different levels in the development of disease which represent somehow Russell's logical types (chap. 3.2). Probably the principles of emergence (chap. 4.10) are also applicable here and it would be most helpful to conceptualise the interrelation between fast and slow mechanisms with this epistemological tool. Second, the two types of alterations seen in atopic disease (fast and slow) correspond to the criteria of Bateson's network pathologies (chap. 6.7). There is a monotone increase in the remodelling process and quick runaways in the fast process.

Third, quick runaways result – according to the theory – from fixed variables, from intervention into a homeostatic process. This theoretical model is supported by a lot of observations of empirical medicine, especially by homeopathy.

Fourth, the monotonous change of the remodelling process corresponds to the lack of rhythms.

These four points do not constitute different categories. They are different approaches to state the same fact. For example, the lack of rhythms is not only an expression of a chronic disease. It reveals also a rigidity of the organism (chap. 6.4), which might be the consequence of local therapeutic interventions, and so on.

#### **d) other miasms and epigenetical influences**

Modern concepts of atopic disease and the homeopathic understanding of chronic disease correspond in most points. Atopic disease and *psora* are partly inherited, begin early in life, have a progressive component difficult to be influenced and early infections play a role.

After Hahnemann, homeopaths added tuberculosis and cancer to the list of chronic diseases. Infections as the cause of cancer is discussed from time to time, but the wider concept of an impaired immune reaction leading to cancer seems to fit better. The relation of tuberculosis to chronic disease is somehow more difficult. As the immunity against tuberculosis is reciprocally related to asthma (Shirakawa et al 1997) there must be a connection. It might be defined as a long term impact onto the function of the immune system in general.

Homeopathy maintains an even broader context for chronic diseases. It claims that the *miasms* (syphilis, *psora*/atopic disease, cancer, gonorrhoea and tuberculosis) have a strong impact on the following generations. This is generally acknowledged for the atopic disease. But in the homeopathic view also the tuberculosis of the parents or grandparents is said to be connected with the prevalence of asthma in the offspring. The same relation is held true for the relation between syphilis in the ancestors and tissue destruction in the offspring, with cancer and depression, to name just a few. That is, homeopathy has always claimed that an acquired disease (or an immunological imbalance as we would say today) might lead to a specific predispositions in the following generations.

There is lately some evidence for such claims. In cancer epigenetical factors might play a role (Feinberg et al. 2006). There are even first concepts assuming a relation between a disease of the ancestors and the following generations. One is the concept of *endophenotypes* (Kennedy et al 2003). It says that a trait

- is associated with the disease in the population,
- is heritable,
- is not state dependent (i.e., it is present even when illness is not floridly symptomatic,
- congregate with the illness within the families,
- is found in not affected family members at a higher rate than in the general population.

The homeopathic model of miasms claims that endophenotypes might be induced by infections.

## 5.6 Acupuncture – Circular Relations

*Issues of this chapter:* function versus symptoms, relational thinking, analogical versus digital, overcoming the split of body/mind and of cause/effect, circular organization.

- *Only a sick person gets sick*  
Chinese proverb

### a) from systemic thinking to barefoot medicine

The oldest texts on acupuncture date back until 300-500 BC. They are about as old as the oldest Hippocratic texts or a little younger. Because of some similarities a connection between the two has been postulated, but has never been proven (Unschuld 2000).

There is some confusion on what Chinese medicine or ‘traditional Chinese medicine’ (TCM) really is. Chinese medicine is a system of anatomy, physiology, pathology with a certain diagnostic approach and a therapeutic system using diet, massage, heat, bodily exercises, acupuncture, herbal drugs, meditation, guidance and advice (Hammer 1990: 82). They are bound together only by the concept of yin and yang and the balance of CHI. CHI is the basic energy inherent in all things. Without CHI stars would not shine. It creates weather and it circulates in the body (Hammer: 79). But as such it cannot be measured (Worsley 1982: 79). Only its effects can be observed. If the harmony of CHI in the body is disturbed, disease arises. Actually the loss of the harmony is already the disease. The signs and symptoms following a disturbance are but hints for the real nature of the disease. Therefore symptoms are but signals (Hammer: 44). Their modalities help to decide on the correct therapy (König/Wancura 1979: 122). Treated is always the disturbance behind the symptoms. A slogan is: “Don’t treat symptoms!” (Worsley: 15).

There is some difficulty in approaching Chinese medicine. It is no homogenous corpus of knowledge, something even more true for modern ‘traditional Chinese

medicine'. TCM has been created by Communist China after a shortage of medical supplies (Süß/Scharl 2004) and after an initiative of the WHO, in an attempt to preserve old knowledge and to fulfil the needs of Western interest (Hammer: 32). At that period Western educated Chinese doctors studied their medical tradition, adopted what seemed 'interesting' and appropriate. Out of that they developed a system called TCM (Jing-Feng in Pearce 2001). It is mainly based on acupuncture (1/3) and herbal therapy (2/3). Both, herbs and acupuncture, are used to influence the flow of CHI in the meridians (König/Wancura 1979: 7). The development of modern Chinese medicine is therefore characterized by several inherent problems. First, there is not one tradition in Chinese medicine, but different sources (Unschuld 2000). Second, modern TCM is not identical with the old Chinese traditions. Third, there are newer Eastern developments in acupuncture that differ from TCM, especially in Japan. Fourth, there is a difficulty for Westerners to understand the philosophy of the East (Schneider 2000, Reibisch 2001). All this contributes to the heterogeneous conglomeration (Unschuld 2000) we see today under the label of Chinese medicine in the West.

The main problem in the Western reception is the attempt to simplify Chinese medicine. Often diseases are treated with certain herbs or by needling certain acupuncture points according to a Western diagnosis. Such reduced form of TCM became a supplement for frustrated orthopaedists, seeing no long term relief with their cortisone injections (Lewis/Halvorson 2003), an addition to the usual technical medicine (König/Wancura 1983: 10), making the physician's practice less boring, i.e., fighting their own dissatisfaction on routine work (Zuger 2004). Or it may be a simple way for practitioners to fulfil the wish of patients demanding CAM.

Already the knowledge of some acupuncture points is sufficient for the relief of pain, as demonstrated by the British Medical Acupuncture Society (Süß/Scharl 2004).

Therefore it is logical that the Society gives a certificate of "basic competence" after three months of practice (Lewis/Halvorson 2003).

Worsley, one of the charismatic figures in Western acupuncture, called this (common) way of practicing Chinese medicine as 'barefoot-medicine' and a shame for well educated physicians. He wonders why Western doctors (in contrast to their eastern counter-parts) prefer such a simple way of practicing (Worsley: 11-16).

One reason might be that the 'barefoot' type of Chinese medicine fits to the Western paradigm, where every clearly diagnosed disease has its clearly defined therapy



treatable in a cook-book style (in haemorrhoids needle GV 20, GV 28, SP6). But the Western way to conceptualise diseases does not match the Chinese principles. Normal Western doctors can't understand acupuncture (Schnorrenberger 1988: 8). A Chinese diagnostic is necessary (König/Wancura 1979: 19).

The main difference between the Western and Chinese medicine is that Chinese thinking is completely relational, a thinking Westerners are not educated in.

### **b) analogical and semiotic thinking**

One of the differences between Western and Chinese thinking is the use of analogical concepts. This effect can already be seen in the writing. Western writing is digital, Chinese writing is analogical. As discussed before (chap. 3.7) analogical descriptions are able to express relations, whereas digital descriptions are better for logical operations. Every depicted Chinese word comprises already analogical associations.

The pictogram for CHI



is composed of



steam or vapour

and



(uncooked) rice

Therefore CHI (life energy) reads: steam over rice.

This seems strange to us and Chinese language is often characterized as rich in imagery. But this is more a problem of the translation. As in Western texts such

analogies are only found in poems, Chinese language seems poetic to us. But for the Chinese this is the normal way of reading and thinking.<sup>17</sup>

Analogical expressions are often sought of having more associations. But this is also a misunderstanding. There are not more, but different associations (analogical versus digital).

For us the liver is an organ with an anatomy and physiology. Examining a patient's liver we might imagine the organ as in the anatomical textbook or *in situ*, or remember some microscopical preparations. We might think of the table of biochemical pathways (the one in chap. 3.5) every medical student knows. The size and consistence of a liver is important. We try to diagnose or exclude hepatitis or metastasis or anything else we have learned and experienced around the liver.

The Chinese liver (GAN) has different associations: Except of the local symptoms like swelling or pain, the liver is responsible for the digestion (constipation, diarrhoea). Also the desire or aversion for a certain food (fat or sour) is seen as liver-connected. A GAN symptom is the sour smell of the body. Moreover, all symptoms of the circulation, especially of the head with pulsating headache are connected to the liver. GAN influences muscles and tendons and is related to muscular tension, cramps (mainly of the legs) and to tendonitis. Every organ has a related organ. In the case of the liver it is the eye. So all kind of ocular symptoms are a liver sign. furthermore, the liver is connected to certain emotions, especially anger and mental flexibility (and the lack of it). For an orthodox thinking, all this seems to be unrelated. But there is the possibility to build a bridge between such different concepts.

The Chinese model of disease is functional. The disease of an organ (ZANG-XIANG) is not only an alteration of the organ itself. It includes every sign the alteration provokes. ZANG-XIANG has been translated as 'reflectoral and algetical signs of an inner organ' (König/Wancura, 1983: 13, my translation). By that it comprises not only objective signs and subjective feelings (König/Wancura, 1979: 121), but all vegetative impacts, neuromuscular relations, the representation on body surface and corresponding emotions, as well (König/Wancura 1979: 216).

A symptom of an organ is therefore (König/Wancura, 1979: 123):

- pain or alteration of the related body surface,
- disorder of the physiological and/or the Chinese organ,
- disorder in an related organ (other as the sick organ),

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<sup>17</sup> Probably it is difficult to translate Western philosophical texts into Chinese

- certain characteristic feelings,
- characteristic emotional states.

These are (in Western terms) not only somatic, psychosomatic and psychological aspects. The Chinese diagnosis includes also the semiotic aspect. It includes every idea the organ stands for: heart for compassion, breath for immediate life experience, etc.

In Western medicine these are different subjects treated by different disciplines. The physician is mainly concerned with the anatomical and physiological aspect. Reichian psychotherapy and bioenergetics are concerned with the functional aspect, although they seem to match best the Chinese concept of organs. But they still miss the semiotic aspect which is mainly covered by psychoanalysis or Jungian psychotherapy. What we see here is actually the split between body and mind, between objective and subjective that is inexistent in Chinese medicine.

A digital thinking has to be analytical and has to develop distinctions. This is neither good nor bad. But digital thinking is only one part. In communication (chap. 3.7) it is the analogical expression that defines the meaning. Based on the knowledge of the relation between syntax and semantics it could be expected that Chinese medicine gives meaning to the processes but cannot be operationalised, as it lacks the adequate logical syntax. In my understanding Chinese medicine tries to solve this problem with a very strict structure.

This lack of an analogical thinking in Western medicine does not only distinguish it from its Chinese counterpart. This lack creates also problems. Human communication, dignity, order of life and many other already discussed issues are only understandable when analogical aspects are included. This might be demonstrated with the term heart (XIN). “XIN refers to the physical, emotional, and spiritual heart” (Jarret 1). In contrast, the heart in Western medicine is but a sophisticated pump. But this is not appropriate. The semiotic aspect of the heart is enormous. Someone with a ‘broken heart’ has more often heart problems (Ebert 2005). And depressed people (where the heart is not able to accommodate SHEN – the spirit) have a doubled risk to suffer a heart attack (Melle et al 2004). Of course, this can be attributed to stress (Gianaros et al 2005).

However, even the slightest impairment of the heart might have a lot of functional consequences for the patient. A pain or arrhythmias might cause a change of posture, of feelings and of behaviour. Also the knowledge of having a ‘heart problem’ induces

in most patients a change in their behaviour and their life style. For the patient everything is included in this picture of the heart, from the last article in *Men's Health*, over the poems and songs on broken hearts, to the picture of a sudden death. The same is true for the physician, he sees plaques, stents, spreading of electrical excitation, and, of course, sudden death, as well. To call this a psychological phenomenon is too restricted. It is the inherent semiotic aspect.

### **c) the missing distinction between cause and effect**

The well trained Chinese therapist has a different way to perceive the process of disease. For him the disease is the felt place, the symptom is the felt symptom, the cause is the observed outer reason (König/Wancura 1979: 188). And all the three are interrelated. That is, the digital distinction of cause and effect is inexistent.

Causes of diseases in Chinese medicine are inner factors like

- joy, fear, anxiety, worry, anger, grief, heredity,  
and outer factors like

- heat, cold, fire, humidity, wind, dryness, dampness

Each outer factor is related with an inner factor. So cold and fear belong together.

They are not only the cause, but the consequence as well. Fear may cause cold and cold may cause fear. Cause and the reactional type are equated (König/Wancura 1979: 185). Only a cold type suffers from cold, only an angry type develops anger. Such relations are rarely observed in a Western scientific setting. A comparable finding is that outer warmth (in holding a warm cup) also increases 'warm' feelings like generosity and caring (Williams/Bargh 2008).

This identity of feelings and emotions is similarly found in Hippocratic medicine. The list of its causes is not only about the same as in acupuncture. The two methods also resemble in the missing distinction of cause and effect. "*Cholê* is both Achilles' anger and the inner juice his body has accumulated in excess ever since his days as a nursling at the breast" (Hanson AE). The main difference between Hippocratic and Chinese medicine is that the Hippocratic vital force is a humour and the Chinese is a steam.

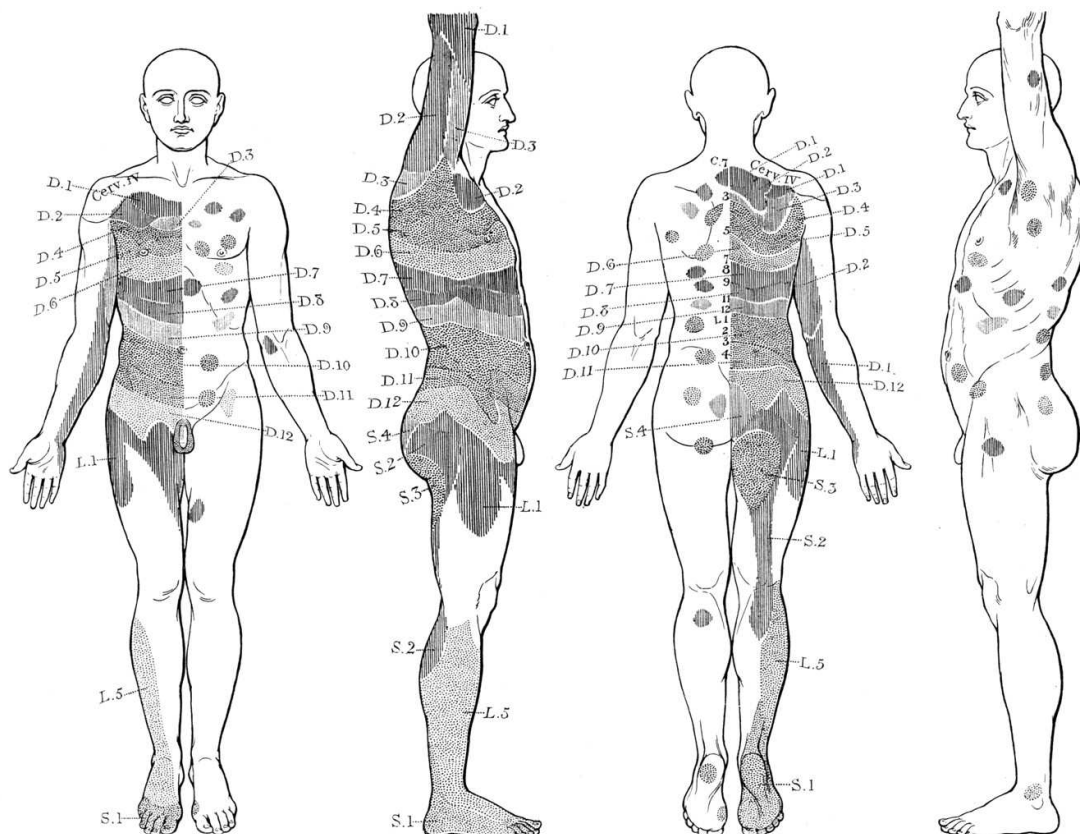
This identity of cause and effect cannot be expressed in digital definitions. Therefore it is impossible to nail down a distinction like body/mind or disease/no disease.

Naturally, western doctors have difficulties with such relational ideas. Therefore, there was always a tendency to 'translate' acupuncture into Western concepts, to

digitalize it. First, all acupuncture points have been given numbers in the West. In Chinese medicine they have only a name according to their (psycho-somato-semiotic) characteristics. The Western point 'Liver 2' is in Chinese XING JIAN which translates into 'to walk the space between'. Or 'Lung 3' is originally 'Heavenly Palace' (TIAN FU) and 'Exchange Pledges, Communicate Faith' (JIAOXIN) became prosaically 'Kidney 8'.

Then, Western scholars soon found out that most (but not all) acupuncture points have a morphological substrate and are related to the course of a peripheral nerve (Schnorrenberger: 11). The localisation and function of certain points on the back, for example, the so-called SHU-points, correspond to the Head's reflex zones in their localisation and function. They had only be detected some two thousand years earlier by Chinese doctors (Beissner et al. 2009).

These points serve as trigger points and can be used to influence the inner organs of the chest and the abdomen. Their use has a prominent position in the Western acupuncture.



That is, these acupuncture points can be interpreted in a stimulus-response manner according to somato-neuro-visceral reflexes (Pomeranz 1997, Süß/Scharl 2004).

The technique to influence inner regulation through the so-called atherom, a neuro-humero-visceral complex (chap. 4.8), is no speciality of acupuncture. Such therapies are quite common in CAM and even in orthodox medicine (König/Wancura 1979: 31). These points are used in

- manual therapy (bones, joints),
- massage (muscles),
- infiltration of a local anaesthetics (neuro-muscular),
- points far from the symptom (acupuncture).

An attempt to explain how acupuncture might influence pain on such a segmental level was

the ‘gate control theory’. Some ‘gates’ that control the transmission of signals in the fibre had been postulated (Kampik 1988: 17), but this theory has later been abandoned, as it does not explain a lot of findings, e.g., how effects of acupuncture might persist after the needle is removed (Martindale 2001). Hormonal models have been used, as well. “Inserting needles at acupuncture points stimulates the nervous system to release morphine-like substances that block pain signals. It may also trigger neurotransmitters and neurohormones, which influence such dynamic systems as circulation and the immune response” (Martindale 2001). In rats it could be shown that this mechanism might lead to reduced blood pressure via endogen opioids (Zhou et 2005). Some also propagate a model of electrical organisation of the body or evolutionary theories (Shang 2004) Kampik summarized the models for acupuncture effects (Kampik: 17):

- Segmental effect
- neurophysiological effect in a larger context
- neuro-humoural effects
- biochemical changes
- bioelectrical changes

#### **d) the relational aspect and circular organization**

The neurophysiological model does not match the Chinese thinking. For the Chinese all points are seen as interconnected, forming a complex polycontextural structure. The logical operator under which this structure is investigated is Yin and Yang. The two represent the ‘sunny’ side or the ‘shady’ side of a situation. Nothing is Yin or Yang. It only characterizes a relation. An element (an organ or something else) might be Yin in relation to one element and Yang in relation to another. This relational

concept is fundamentally different from Western thinking as it assigns no definite value to a certain state. Actually there are four pairs of relations which have to be investigated in every patent, the *Eight Principles* or 8 Rubrics:

- Yin, Yang
- Interior, Exterior (Biao Li)
- Cold, Hot (Han Re)
- Excess, Deficiency (Xu Shi)

These are the modalities that, according to Chinese medicine, characterize every symptom and express all living processes. The understanding of this structure enables the therapist to observe the floating processes, to intervene adequately and to judge the development of the therapy.

Furthermore, the whole is embedded in the cyclic process of nature, in the circular organisation of CHI. The so-called five elements, fire, earth, metal, water, wood are a blueprint for this change which governs also all physiological processes.

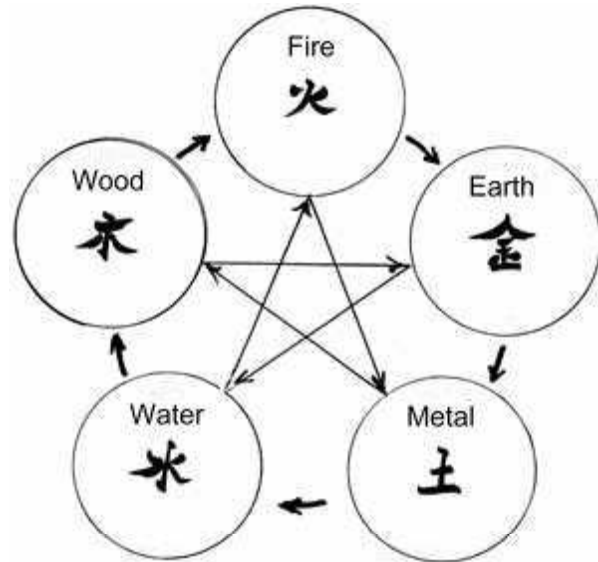
The five elements are organized in a circular way. Energy is given clockwise from one element to the next.

Chinese medicine describes the relation between the elements with an analogy of the family. The element or meridian that gives away energy is called the "Mother" and the element or meridian that receives energy is called the "Son" or 'Child'.

If the child is disturbed then the mother becomes sick. It might sometimes even be the grandmother (Worsley: 46). Therapy has to understand this and take it into account.

The 'Mother-and-Child-Rule' says that if the mother is in excess the child has to be sedated and if the child is in deficiency the mother has to be tonified. If in such a case the child is treated the mother might even become worse (Worsley: 48)

It might be accidental that Chinese medicine uses examples of the family structure (mother-and-child-rule, husband-and-wife-rule). But they resemble strikingly the circular causalities of family therapy. Also the conclusions on how to change a pathological pattern is not so different.



## 5.7 Efficacy of CAM – the Methodological Problem

Most methods of CAM are not acknowledged by the scientific community. This is partly due to their theories. But it is also due to the fact that most of these methods are not able to prove their efficacy through randomised controlled trials (RCTs). "Some maintain that complementary medicine cannot be evidence-based in the conventional sense of the word; that "softer" types of evidence need to be taken into consideration as well); that placebo effects must not be dismissed as nonbeneficial; that the healing encounter includes significant factors that may never be quantifiable; that "the scientific method cannot measure hope, divine intervention, or the power of belief." And, obviously, research in complementary medicine "must consider social, cultural, political, and economic contexts" (Ernst 2003a).

Although proponents of EBM believe that "saying something cannot be tested by trials simply betrays ignorance of the scientific method—you can construct a trial to test practically anything" (Ernst cited in Carter 1996), there is a methodological problem which makes it nearly impossible to apply RCTs to regulative therapies (Fønnebø et al 2007). This is of special interest in the context of this work as a systemic medicine will probably also have a regulative character. That is, a systemic medicine will encounter the same difficulties with EBM as CAM has.

In the first place, there is a certain bias of orthodox medicine to prove the ineffectivity of CAM (Linde et al 2001b). This can be done with a lot of statistical techniques (overview in Kiene 2001: 85-100). Two major publications proving the ineffectivity of homeopathy shall demonstrate this:

242 asthmatic patients with positive prick test for house dust mite were given a potency of 30C of house dust mite. The result showed no difference between the placebo and the verum group (Lewith et al 2002). The bias in this study is the following: First, there was no individualisation. All patients were given the same remedy, something incompatible with homeopathy and any other strategic therapy. Second, a remedy was used (house dust mite) which is not used in homeopathy. As the authors were aware of their unusual procedure, they stated: "This treatment is not usual homoeopathic practice but offers a testable model for differentiating between infinitesimal homoeopathic dilutions and placebo." That is, they



constructed a setting that can be controlled, although it has nothing to do with homeopathy. This would exclude any statement on homeopathy or at least make the results very doubtful. Nevertheless, the related editorial came to the conclusion “that new trials of homoeopathic medicines against placebo are no longer a research priority” as research funding is a scarce resource (Feder/Katz 2002). This comes despite the fact that homeopathy has proved to be effective under practitioner’s condition in allergic rhinitis (Lewith et al 2002). In this case is applicable what Robert Temple has said: "When you have a trial like that you can learn two things...You can tell whether your drug is better than a placebo, and you can also tell whether the study is a useful study” (Taubes 1995 cited after Kiene 2001:86).

The second publication was a meta-analysis overviewing the available trials for homeopathic treatment. The study used 110 studies for the review. Due to statistical or scientific shortcomings the authors discarded 96 studies. On the basis of 14 studies they found a certain evidence for their assumption that homeopathic treatment is only a placebo therapy (Shang et al 2005). The related editorial proclaimed “The end of homeopathy” (Lancet editorial 2005). However, the study itself had severe shortcomings. For example, it was not mentioned which studies were included into the meta-analysis and the authors and the *Lancet* were reluctant to reveal them. Only after months of international protest the data for the meta-analysis were published on the web-side of the authors but removed after short. They had used studies like the house dust mite study and similar others which had nothing to do with the strategic concept of homeopathy. The material revealed also further shortcomings. (Dellmour 2006). A comparable article in favour of homeopathy would have been retracted immediately.

Interestingly, Lancet had published a more carefully made meta-analysis in favour of homeopathy nine years earlier (Linde et al 1997). This meta-analysis was ignored by the medical community, whereas the negative outcomes made it into the headlines. Simultaneously with the cited negative meta-analysis, BMJ published a meta-analysis on antidepressant showing that they do not prove better than a placebo (Moncrieff/Kirsch 2005). But nobody declared the end of the antidepressant therapy. We see here a biased atmosphere making sound discussions on the efficacy of CAM difficult.

The major problem in judging CAM is that most of its methods use an individualizing therapy, something incompatible with randomisation. Even a simple body massage

has to be individually adapted for every patient, otherwise it cannot be successful. What is good for one person can be harmful for another. So how to evaluate a study which compares the effect of a standardized physiotherapy (massage, warmth, cold, etc.) with the simple, standardized instruction to stay active? The result that physiotherapy is not superior to this simple advice (Frost et al 2004), might not be of great relevance. Important, however, is that both treatments (standardized therapy and standardized advice) are bad medicine.

The fact that a schematic therapy is bad medicine has already been stressed for balneology (chap 5.4.a) and emergency medicine (chap. 2.1.f). As methods like psychotherapy, acupuncture or homeopathy are even more dependent on an individualization they can less be judged with a simple randomised study. This might partly explain why these methods work well under practitioners' conditions (Güthlin et al 2004, Vickers et al 2004) – have better results with lower costs (Witt et al 2005, Ratcliff et al 2006) – but fail to prove effective when put into the corset of randomised trials. The higher the methodological standard of a trial is, the less effective are such therapies (Süß 2004).

Besides individualisation another factor is important. In hamsters it has been shown that wounds heal quicker if the wounded is in a normal social context. If the animals were in a glass tube (comparable to a hospital based medicine?) the wound became even worse (Detillion et al 2004). In the second case a therapeutic intervention might prove effective, but could turn out to be a placebo in the first case. That is, the more supporting the frame conditions are, the less specific a therapy will work. As it is generally accepted that regulative therapies like psychotherapy, homeopathy and acupuncture provide a supporting atmosphere whereas hospitals often do the opposite it is difficult to compare their results of efficacy control.

To illustrate how RCTs miss the principles of an individualized therapy I published the following example (Ivanovas 2001a): In headache acetylsalicylate may be tested against placebo. But it makes no sense to test the homeopathic remedy Bryonia D6 against placebo, as every patient has to receive an individualised remedy. On the same logical level would be to give in a general practice with all kind of diseases (depression, asthma, peptic ulcer, colds etc) one group acetylsalicylate and the other placebo. The results after one year would say nothing about the effectiveness of acetylsalicylic acid in special or of drug therapy in general. This example prompted strong objections, claiming I would reject randomisation (Schuck et al 2001). But

there is no randomisation in an individualizing therapy. Thus, the specific approach is not appropriate for many CAM therapies (Paterson/Dieppe 2005).

But there is also a formal problem: A study can only come to conclusions on the issue they measure. When a potency of house dust mite in an allergy against house dust mite does not prove better than a placebo then the result is only that a potency of house dust mite is not superior to placebo under these conditions. It does not say anything about a potency of house dust mite in any other diseases, nor does it allow conclusions about potencies in general or on homeopathy in special. In the same way, a study which does not show a positive effect of acetylsalicylic acid in breast cancer (Cool et al 2005), cannot evaluate the effectiveness of acetylsalicylic acid as such, and the effectiveness of pharmacotherapy in general. That is, most designs of RCTs in CAM are a violate the basics of logical typing (chap. 3.2).

There have been attempts to perform studies according to the necessities of CAM. The *Munich Headache Study* was a carefully performed study. It fulfilled the *a priori* criteria of statisticians and homeopaths. The study consisted of patients who suffered from headache with an average of 23 years, had 2-3 times headache per week with an duration of more than 8 hours. Patients had, in average, a lot of premedication. Participants had no special high expectation in the result of the study. The normal medication was interrupted and patients were treated according to the approved regimen of the German Migraine Society. These patients were treated for 12 weeks where a patient was seen twice by the homeopathic team, once at the beginning, once after 4 weeks where the prescription could be changed. The study showed no superiority of the homeopathic remedy to a placebo. However, in both groups there was a reduction of headache of about 25% in frequency, duration and intensity (Walach et al 1997). The result showed that the homeopathic treatment worked, but not the remedy.

Afterwards, as always when a study does not show the expected results, there had been many objections by homeopaths such as

- the duration of the study was too short,
- the discontinuation of previous remedies might have brought forth side effects,
- the design was too strict for the seriousness of the cases, i.e., the expectation that one remedy fits for the disease (what might be true for short diseases).

Independent of the soundness of these arguments the study poses a problem for homeopaths and for orthodox medicine. The homeopathic therapy was highly effective, low in side effects and performed much better than the standard drug

therapy. But it did not work in a specific way. The paradox that something is effective although it is not effective is typical for a violation of logical types. There has to be some logical confusion, as nobody would claim to ban orthodox drug therapy although this would be the only legitimate conclusion according to EBM standards. The result of the *Munich Headache Study* is not singular. Quite a lot of studies come to the result that the CAM treatment is effective but not better than a sham intervention. The *German Acupuncture Trials* (Gerac), the largest ever undertaken study on acupuncture came to this conclusion. Patients with osteoarthritis of the knee and low back pain were treated either with a conventional therapy, or with acupuncture or with placebo-acupuncture where a point was needled not existing in Chinese medicine. After half a year the correct acupuncture performed not better than the placebo acupuncture, but both were much better than conventional pain therapy (Hackenbroch 2004). This was verified with studies on gonarthrosis (Bermann et al 2005, Scharf et al 2006), on migraine (Linde et al. 2005; Diener et al 2006), on different forms of chronic pain (Melchart et al. 2006) and on low back pain (Haake et al 2007).

The possible explanations demonstrate the difficulty and confusion around the issue:

- *placebo-hypothesis*: Homeopathy and acupuncture might be a placebo therapy, then their effect would be less prominent with the time, according to the principle: *Hurry, hurry, use the new drug before it stops healing* (Shapiro/Shapiro 1997: 14). This could only be proven in longer trials.
- *nocebo-hypothesis*: It could be argued that the orthodox therapy is a nocebo therapy, i.e., a therapy that harms, such that a placebo therapy performs better.
- *hypothesis of unspecificity*: Homeopathy and acupuncture might provide an unspecific therapeutic effect which is not inherent in the given drug or in the inserted needle, but reveals its effect through the modus of interaction. It is a question of definition to separate this from the placebo effect
- *design hypothesis*: RCTs are in general not capable to assess the effectiveness of individualizing therapies

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The results of the *Munich headache study* and the *German Acupuncture Trials* remind the *dodo verdict* of psychotherapy. The *dodo verdict* says that psychotherapy works but the effect is independent of the technique, i.e., all kind of therapies work about the same.

The early positive results of psychotherapy were always individual case reports. No efficacy control existed. A first blow shocked the psychotherapeutic community when Eysenck published in 1952 an article, stating that psychotherapy is not more effective

than no therapy and might even be less effective (Eysenck 1952). Since then such results are regularly found (Stevens et al 2000). For example,

- psychological interventions after car accidents with shock make things not better, but worse (Hobbs et al 1996),
- psychological treatment is not more effective than placebo, however, antidepressive drugs work better in a trial in a health care centre in Goa (Patel et al. 2003).

Mostly such trails are of low quality and also Eysenck has been criticized mainly on a formal level (Mc Neilly/Howard 1992). The arguments are much the same as seen in CAM, concerning issues like individualization, specific treatment, the role of the therapist etc.

The last decades, especially in the age of EBM a lot of research on the efficacy of psychotherapy was done. But the results resemble more “a lottery” (Goldbeck-Wood/Fonagy 2004). Two comprehensive meta-analyses based on the available studies came to opposite results. For one the effectiveness of psychotherapy is beyond doubt (Lambert 2003). The other finds little evidence for most methods. Only behaviourism and cognitive therapy perform well (Grawe et al.1995). Of course the work of Grawe was criticised, mainly by those methods that failed (Tschuschke et al 1998).

Grawe’s meta-analysis is in so far interesting as it is comparable with the work of Ernst for CAM. Ernst holds the only chair of CAM in Europe (University of Exeter) and tries to apply strict methods of EBM. He finds only herbal therapy convincingly effective. Strikingly, behaviourism and herbal therapy resemble most the concept of the specific therapy used in orthodox medicine. This is a further hint that the efficacy control of EBM (in the traditional way) is only suitable for a certain methodology but fails in other respects.

Both works, the meta-analysis of Grawe et al. and of the research team of Ernst (Jonas/Levin 1999; University of Exeter 2004) give overviews on psychotherapy, respectively CAM where everything is neatly summed up according to some criteria. Grawe et al and Ernst do not take any methodological problems into account and are probably not aware of them. They misunderstand that their approach does not mirror efficacy but their tool of investigation.

This can be demonstrated with music therapy. Music therapy has a lot of good observed effects, especially in traumatised patients (Case/Else 2003) or after stroke (Särkämö et al 2008). Sacks, in his account of the inability to move his leg after the

inner representation had been lost (chap. 2.2), describes how he overcame this inability suddenly by hearing the music of Mendelssohn (Sacks 1984: 146). Sacks cites Novalis who said that every disease is a musical problem and healing is a musical solution (Sacks 1984: 137).

This shall be further illustrated by the following example: A five year old autistic boy who had never uttered a word had been sent to music therapy. The therapist accompanied the screaming and yelling of the boy with related sounds on the piano. Thus, he was able to 'communicate' in the terms of the boy. Slowly they developed a stronger communication. Finally the boy sang the first words in his life "a song". With this technique the boy developed a certain ability to communicate (Neugebauer 1994 cited after Kiene 2001: 54-55). From the point of view of evidence-based medicine such a narrative is without any relevance. The development of the boy could have been accidental, or the effect of the therapy might have been due to a placebo effect. In any case, it is impossible to deduce the efficacy of music therapy from such single cases even, well, for once, there might be a certain plausibility. But a prove of efficacy? Never!

Music does a lot more (chap. 5.4.a). Amateur chorus singing increases IgA and decreases cortisol levels, i.e., boosts the immune system (Kreutz et al 2004). Music helps to develop verbal and cognitive abilities in childhood (Ho et al 2003) and better cognitive abilities in childhood are correlated with better health later (Martin et al 2004). But also the recitation of poetry synchronizes respiration and heart rate (Cysarz et al 2004). Making music together leads to a synchronization of the brains (Lindenberger et al. 2009), to a kind of mirroring, where a lot of information is exchanged that never can be quantified. That is, music and rhythms might influence inner rhythms in a multitude of ways. Neurophysiology developed related models recently (Peretz/Zatorre 2003, Sloboda 2003, Dobbs 2008).

But how should all this be proved in a randomised trial? Studies like "*The effect of Mendelssohn's music in postoperative movement disorders. A prospective, randomised, (double-blind,) placebo-controlled trial*" (the placebo might be the evening news) or "*The use of the piano in the treatment of autistic boys. A prospective, randomised, (double-blind,) placebo-controlled trial*" (the placebo might be a triangle) are absolutely absurd. They misunderstand what is happening in life and in the therapeutic relation.

Trials are not able to model individual reactions. This is why music therapy will never show the same effects as a behaviouristic intervention to combat agoraphobia, although music therapy might be much more beneficial for the health of the patient. Music therapy might induce a learning on a higher level, whereas behaviouristic and cognitive approaches might change only the surrogate parameter leaving the adaptation untouched.

CAM, like every method (Sackett/Wennberger 1997) must find its own design of efficacy control. The main problem will be to solve the question how individualization might be conceptualised? Newer attempts like *formal case studies* (Thompson 2004) or *Cognition-Based Medicine* (Kienle 2005) try to overcome the usual restrictions. But only time will tell whether such methods can really be translated into medical practice.

## 6. Towards a systemic medicine

### 6.1 The Necessity of a Systemic Medicine

For a lot of reasons it became necessary for our current medicine to adopt systemic concepts. The most important are in my opinion:

#### *Complexity management in basic research*

Basic research in biology and physiology has reached a point where no further progress seems to be possible without systemic tools (Reeves,/Fraser 2009). Polycontextural concepts (chap. 3.5) are necessary to model recursive and complex processes. This is especially true for brain research and genomics (Ahn 2006a; 2006b), but concerns all other medical topics, as well (chap. 2.8). The *European Science Foundation* sees in systems biology the ‘key to future medical breakthroughs’ (European Science Foundation 2009).

#### *Limitations of the reductionist approach*

The machine model in medicine (chap. 2.1.a) expecting that the correction of a subsystem has no further impact onto the whole has led to a tremendous improvement of short term therapies. In the treatment of chronic diseases the contemporary approach was less successful. Too often current medicine provides only a symptom management. People live longer, but “they experience poor health for longer” (Cole 2005) and it is even uncertain whether medicine contributed to this longevity (chap. 2.2). For some time there was the hope that the engineering of hormones, enzymes or the genome would solve this problem. But these hopes slowly fade away. The manipulation of certain physiological mechanisms does often not lead to a long term benefit.

Already in 1968 Bateson provided a detailed model why this is so. Based on the cybernetic research of Ashby he demonstrated that linear interventions, which he called *conscious purpose*, might contribute to a decline of health (Bateson 1972: 426-447) by inducing ‘network pathologies’ (chap. 6.2, 6.7), as they are called today.



### *The exclusion of value decisions*

Reductionism creates a situation which has been branded as an autistic-undisciplined thinking (chap. 2.1.c), making it often difficult to come to clear decisions (Hu et al 2004). But also 'clear evidence' is often more a result of which facts are taken into account and less of the encountered situation. Much depends on the underlying beliefs and values of the physician (Geneau et al 2008). However, value decisions are normally not addressed as such. They appear in the disguise of 'clinical decisions' (Parker 2004, Sennet 2003).

An example: The hygiene hypothesis says that the contact with a variety of germs is beneficial for the health of asthmatics. A value decision would be: "Eating dirt or moving to a farm are at best theoretical rather than practical clinical recommendations for the prevention of asthma" (Weiss 2002). Nevertheless, some physicians expect from their patients with chronic disease a fundamental change of life-style. The administration of probiotics (chap. 2.8.b) would be a method of eating dirt, even in line with the prevailing opinion that therapy is drug therapy. Some scientists also proposed to vaccinate atopic patients in order to induce an appropriate immune response (Watts 2004). But does it makes sense to vaccinate against a large number of germs which might contribute to atopic disease (Bach 2002) and then to vaccinate other germs to counter-balance this effect? It is not important to discuss here whether these theories are valid or not. The example shall only demonstrate an important question: what kind of control or therapy is intended?

Other examples of value decisions are: Is polypharmacy in a 95 year old lady really an improvement for her life (Fitzpatrick 2003)? In how far are the aims of the physician in line with the values of the patient? Might an unspecific therapy be better than a specific therapy or even no therapy at all? What kind of supporting measures are necessary? What will happen under changing conditions? After 5, 10 or even 20 years? How is the patient to be convinced to follow the directions of the physician? By authoritarian behaviour? By frightening the patient? Or by discussing pros and cons? Who decides under which circumstances?

These are crucial and everyday questions in medical practice. They include the question of power (chap. 4.6), as well as question of the order of life (chap. 5.4.b). For their decision the normal 'evidence' provides at best a supporting help.

Most physicians are not aware that they make continuously value decisions. Such issues are rather seen as an ethical or humanistic affaire, not as scientific medicine (Cousins 1979: 125 – 160).

### *The therapeutical context*

The current epistemology (the reductionist and specific approach) creates a picture where the therapist (the most relational aspect in medicine) should be irrelevant for the therapy (Hammer: 49). The therapeutic relationship seems to be just an appendage of drug therapy subsumed under the label of the placebo effect. In its final consequence the specific medicine can be done by machines. There are already proposals to connect ever physician via internet with the *National Library for Health* providing him/her with the best possible evidence for the patient. The only task left for the physician would be to help the patient to consider the harms and benefits of a therapy (Evans et al 2006: 96-98). But no physician is necessary to do this. It could be done by a nurse or an interactive computer program. Also the specific diagnosis could be established through a questionnaire leading to a series of machine based tests. Even googling leads already to a quite successful specific medicine (Tang, Kwoon Ng 2006).

Such proposals and developments show that the ‘specific’ medicine is blind for the therapeutic reality. Many things happening in the therapeutic context (chap. 5.7) just do not appear in the scientific context. These issues seem to represent a kind of not reliable soft science (Nature editorial 2005a). It is therefore no surprise that there is a steady decline of patients’ confidence in the physician (cf. Chen 2008c and the related bolg of the New York Times). Although the psychosomatic movement of the last century has investigated such topics with certain results, the whole approach remained somehow vague, probably because the specific paradigm has rarely been abandoned. The psychoanalytical concept of transference and counter-transference was a first attempt to describe the pattern between the therapist and the patient. For general practice the Balint groups (chap. 2.2) train the physician to understand, or better, to perceive that a lot more happens in the therapeutical setting than suggested by our models. There can be no doubt that the process of mirroring (chap. 4.2) has an enormous impact for the therapeutical relation, as well, but we have no idea in how far a therapy is influenced by the structural coupling of humans. May be there is even a ‘conjoined physiology’ (chap. 5.2) between physician and patient.

A scientific medicine has to render an account for such processes. But this is impossible with the current epistemological tools. Therapies like hypnosis or suggestive therapy represent somehow the science of the unspecific. They focus mainly on the context of the therapeutical relation whereas the specific approach focuses on the content. But the two remain unconnected.

#### *Limitations of medical cognition*

Some formal aspects influencing medical cognition (chap. 2.2) are:

- 1) In the specific concept a learning of a higher order cannot be modelled (chap. 4.3).
- 2) The specific model is not able to understand fluctuations far from the equilibrium (chap. 6.4).
- 3) Is not able to understand complex rhythms (chap. 5.3.b).
- 4) It is not able to distinguish between robustness and rigidity (chap. 6.4).

#### *Statistics have no semantic relevance for the individual*

Statistical medicine with its emphasis on randomised controlled trials is a kind of deadlock in regard to the individual. It is only able to provide a general impression. Individual statements are impossible (chap 2.1.f; 2.5.d). They have no semantic relevance (chap. 2.1.b). A therapy might be beneficial, harmful or without consequences for an individual despite the effects found for a population. There is, for example, no possibility to predict immanent side effects of a therapy. "Over the past 30 years attempts have been made to enhance the recognition of adverse effects by "data dredging" or "data mining." But the results have been modest (Stricker/Psaty 2004). A solution cannot be found in statistics. What seems to be necessary is a model of individual prognosis. This might be developed from a combination of empirical experience with systemic concepts including biological hierarchies (chap. 6.12).

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Such a new model provides a language that allows the investigation of relations, generates questions and becomes a tool for comparative studies of different fields of phenomena (Bateson, 1988: 37). For example, until recently the biological theory excluded the possibility of the transmission of acquired characteristics. Now, as the

theory has changed, observations supporting this theory proliferate. “There is nothing more practical than a good theory,” as Lewin has said

In order to understand a systemic medicine and to initiate further developments only one main prerequisite is necessary: health, disease and therapy have to be understood as regulative, not as statical. Although probably nobody would really doubt that medicine is regulative, the regulative approach has certain implications which some might hesitate to accept. First, regulation is an emergent process (chap. 4.10) where simple causal attributions hardly describe the observed events. Second, changes (and even the status quo) have to be observed in time series, and cannot be judged from a snapshot.

## **6.2 From Specific Disease to Network Pathologies**

The emphasis on specific diseases has generated the impression that diseases have a certain kind of distinct reality. They were no longer seen as a description or a map of the human condition. They have become a kind of an own territory (chap. 3.8). But as this is not the case, the epistemological inconsistency must appear somewhere. In fact, the growing knowledge about physiological processes makes it ever harder to subsume all findings under the label of one specific diseases. As a result there are shifting definitions of many diseases. The definitions depend more on the scientific approach and have less to do with the patients. A disease like asthma might be defined according to its phenomenology, pathophysiology, genetical influence or therapeutical possibilities (Holgate/Polosa 2006). Each time it will be a somehow different disease. The same is true for schizophrenia (Mueser/McGurk 2004). Osteoporosis might be seen as a disease, as a risk factor or as an emergent physiological phenomenon (chap. 4.6). Infections can be classified according to germs, typical symptoms, genetical disposition or the status of the immune system. The confusion about the chronic fatigue syndrome (chap. 2.1.f) is another expression of the epistemological difficulty to coin clear-cut diagnoses.

However, when disease is understood as a description of a human condition and not as an independent entity things become more intelligible. Characteristic traits then represent a part of a larger picture. Already at the very beginning of scientific medicine Bernard wrote: “Indeed when we wish to ascribe to a physiological quality its value and true significance, we must always refer it to this whole, and draw our final conclusion only in relation to its effects in the whole” (Bernard: 89).

That is, a certain physiological (or pathophysiological) finding makes only sense in the context of the whole human, in the context of autopoiesis (chap. 4.8). The human has to be judged in his environment and not in isolation. For example, the rate of type 1 diabetes among the children of Pakistanis who migrated to the United Kingdom is the same as the rate among non-immigrants in the United Kingdom (11.7 per 100,000), or about 10 times as high as the incidence of type 1 diabetes in Pakistan (1 per 100,000) (Bach 2002). When Turkish families move to Germany children suffer as half as often from asthma. The more they adopt a German life-style the more their incidence of asthma approximates the German figures (Swarf 2006). Many factors play a role such as toxins (Stevens/Bradfield 2008), nutrition, genetics, epigenetics, family structure, stress and others. And despite the strong genetical component in obesity (Frayling et al 2007), the social network is even more important in its development (Christakis/Fowler 2007).

“The conditions necessary to life are found neither in the organism nor in the environment, but in both at once” (Bernard: 75). It is incredible how precisely Bernard defined these relations which today are considered as brand-new insights (Barabási 2007).

In order to understand what disease and therapy is, a bundle of contexts has to be taken into account. Only such a wider view is able to unite the multitude of observations. “It’s the network, stupid!”, exclaim the editors of *PLoS Medicine*, trying to explain that everything in medicine is connected (PLoS Medicine Editors 2008).

In such a view diseases are an emergent phenomenon. They can be called *network pathologies*, and might be defined as follows: “Network pathologies arise when the body self-organises in response to some disturbance, but becomes confused and ends up worse at self-regulation than before....There is clearly a failure of self-regulation, in which some parameter of a control system has been set wrong...It's not unreasonable to imagine that all these different causal factors are inputs to a network, and that they confuse it into thinking that its normal immune response is inadequate“ (Hyland 2001).

This first definition shows some important traits of network pathologies, misses, however, the fact that characteristics defined as pathological from an observer might be the means to maintain an equilibrium (chap. 5.2).

### 6.3 Regulation and Disease

Pathologies in a network are regulative. Such a regulation might lead to morphological alterations like the remodelling process in asthma (chap. 5.5.c). But a disturbed regulation might also be the consequence of a morphologic alteration. That is, no clear causal relation between function and structure can be found anymore. Therefore the search for a definite cause becomes doubtful. In such a view, disease is emergent. It was a kind of a shock for the biologists that even the genome, long time thought of as the grail of causality, is involved into such recursive processes (Chen et al 2008). For an orthodox thinking such a view creates some difficulties (Nature editorial 2005 b) as many of the trivial concepts of the machine model just vanish. The distinction between nature and nurture, for example, or between inner and outer, as demonstrated earlier with the gut flora (chap. 2.8.b) or in 'mind' models (chap. 2.3.h). All these distinctions including how the observed system should be defined is mainly a question of convenience, results from the problem to be solved. The recent attempt to define chronic disease as an imbalance of the immune system is a major step towards this direction. Th1 cells and Th2 cells are reciprocally organized. Th1 inhibits Th2 and vice versa (Schwartz 2002). That is, T helper cells have a tendency to develop a schismogenetic pattern (chap. 4.2). When one side prevails disease arises. A prevalence of Th1 helper cells is connected with a predominance of humoral immunity leading to autoallergic pictures like multiple sclerosis, rheumatic arthritis, Hashimoto and others (type 1 disease). A prevalence of Th2 helper cells is connected with a predominance of cellular immunity leading to diseases like systemic lupus erythematosus, vasculitis, atopic disease characterized by a lack of reaction to acute infections, e.g., hepatitis B and C, tuberculosis (type 2 disease) (Kreutzfeld/Müller 2001) or haematological malignancies (Soderberg et al 2004). As Th1 and Th2 tend to develop a schismogenetic pattern, this recursive cycle has to be embedded in a larger context of biochemical and physiological reactions (inner environment). Otherwise the least divergence from the balance would necessarily lead to an increasing imbalance, finally destroying the human. One could define the whole of this inner environment, of the milieu intérieur as a semantic structure. This implies that whatever happens in this context has a certain meaning. The meaning is to protect the whole organism. One part of the protective measure is the immune system. It has

to distinguish between self and non-self. In practice it is a tightrope walk between an insufficient immune defence and autoaggression (Germain 2001).

## 6.4 Robustness and Rigidity

A system is defined as *robust* when it continues to function in the face of outer perturbations (Wagner 2007: 1), or in the case of inner problems, like a temporal failure or permanent loss of some components (Marcia/Solé 2008). The first part of this definition refers to the biological sight, whereas the second part is a more technical perspective. Due to its machine model current medical science is more concerned with the second part of the definition, and most of medical practice tends to improve defective components., at least in theory.

*How can robustness be assessed?*

This is not an easy question. Some maintain that robustness can be tested on the level of “a part (protein), a trait (wing shape), or a capability (amino acid biosynthesis). The less the feature changes in the face of perturbation, the more robust it is” (Wagner 2007: 3). This represents a typical reductionist point of view. In this view it seems to be logical to test, for example, genomic robustness to come to conclusions about the robustness of an organism (Lenski et al 2006). This is, however, a fallacy. What is true for a member of a class is no longer be true for the class itself. Such a violation of the logical types leads necessarily to a paradox (chap. 3.2). The paradox of robustness research shows up, when the notion of *evolvability* is introduced. Evolvability is either understood as the ability to adapt to changing conditions or to reproduce itself. Both meanings are an expression of autopoiesis and we can refer to what has been said before (chap. 4.8): In order to adapt to perturbations the autopoietic unit has to change, otherwise it will cess to exist. Or shorter: *In order to be robust, an autopoietic unit has to be evolvable*. Reductionism, however, suggested that the more robust a system is, the less evolvable it becomes (Wagner 2008). This paradox vanishes when two preconditions are given:

- The logical level has to be clear: For example, “a highly robust RNA genotype has low evolvability. In contrast, a highly robust phenotype has high evolvability” (Wagner 2008).

- Clear definitions have to be used. I suggest: A behaviour is *robust* when a system reveals a high evolvability. A system with a low evolvability should be called *rigid*.

This former definition could be refined by saying that a system is rigid if it shows characteristics of learning 0 or I. A system might be robust if it shows characteristics of higher orders of learning. But such a hypothesis has to be tested further.

#### *How is a system robust?*

In mechanical systems robustness is achieved by redundancy. That is, multiple copies of a given component are available to the system. But this is not the case with the living systems. Actually redundancy would not make too much sense in the living. Under changing conditions (that is in the case of perturbations) multiple copies of the same component would not improve the adaptability and the evolvability.

Living systems attain their robustness through a mechanism called '*degeneracy*' or '*distributed robustness*', which is the ability of structurally different elements to perform the same function (Marcia/Solé 2008). This has been metaphorically explained by a 'neutral space' containing a collection of equivalent solutions (Wagner 2007: 6). Meant is nothing else than the equifinal ability of a system to achieve a goal. This is realized by the interaction of the parts in a network. From brain research it is known that the nerves create new patterns and a new structure confronted with new tasks (Rae-Dupree 2008). Something similar is found in bacteria, where the genetical network improves its evolvability just by adding new links in the gene (Isalan et al 2008).

Distributed robustness has two main characteristics. The first is obvious and generally accepted: *Robust living systems are nonlinear*. The other characteristic is rather surprising: *Nonlinear living systems are operating far from the equilibrium* (Goldberg et al 2002). It is surprising as it is against the usual expectation that physiological control in healthy systems aims to reduce variability and to maintain physiological constancy (Goldberger et al 2002). But the opposite seems to be true (Buchanan 1998). *Maintaining constancy is not the goal of physiological control* (Goldberger et al 2002).



Fluctuations are essential for a living process. They are necessary to compensate perturbations. Famous is the picture of a tightrope walker making chaotic and sometimes strong movements in order to keep balance.

The opposite, rigidity is a characteristic of pathological states. In terms of emergence (chap. 4.10) it is a condition where an environmental perturbation does not lead to a series of reactional patterns. In the terms of synergetics (chap. 4.11) it is a ball in a valley, not able to leave it anymore, even if other valleys would be energetically more appropriate

### *Robustness and rigidity in the living*

These theoretical considerations are supported by many physiological findings. It can be shown that robust systems reveal a nontrivial behaviour far from an equilibrium, whereas rigid systems are found in states of disease.

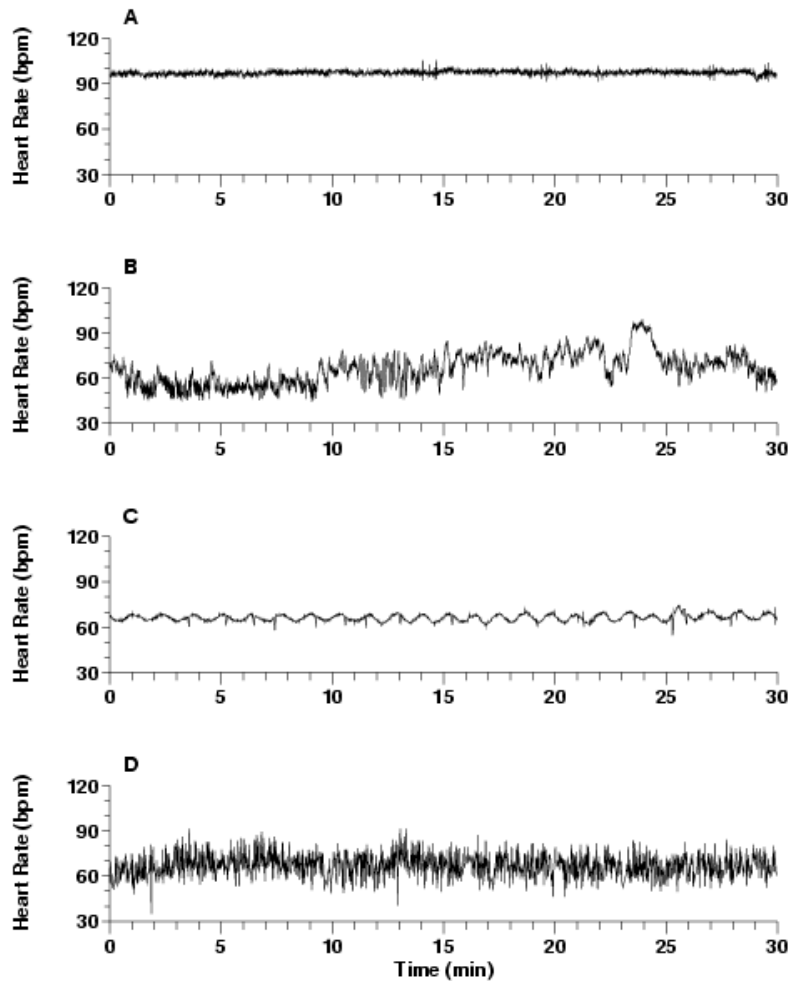
States of reduced reactions correspond often to severe developments. Babies are known to have large fluctuations in their physiological processes. Taking deep breaths – the regular sighing - is essential for them (Baldwin et al 2004a). The reduction of fluctuations might indicate a breakdown of the whole system. Sudden infant death syndrome, a typical network pathology (Bajanowski/Poets 2004), is often preceded by monotonous heart rhythms (Casti 1997).

In an attempt to establish an algorithm describing the normal heart function it has been found that the pattern is chaotic, but not random. The heart ‘remembers’ the last 200 beats and steadily compensates recent rhythms (Buchanan 1998). That is, there is a structure in the fluctuations far from an equilibrium with an inner logic which can be described by mathematical models. In disease this ‘memory’ is erased. It is the loss of rhythms already seen in chronomedicine (chap. 5.3.b). This fact remains normally unnoticed as “traditional algorithms indicate higher complexity for certain pathologic processes associated with random outputs than for healthy dynamics exhibiting long-range correlations. This paradox may be due to the fact that conventional algorithms fail to account for the multiple time scales inherent in healthy physiologic dynamics” (Costa et al 2002). That is, chaotic fluctuations embedded in the general reactional pattern will look like random and superfluous from a linear point of view.

These characteristics become more clear in the following practical examples.

The first illustration (PhysioNet) shows four different types of heart rate.

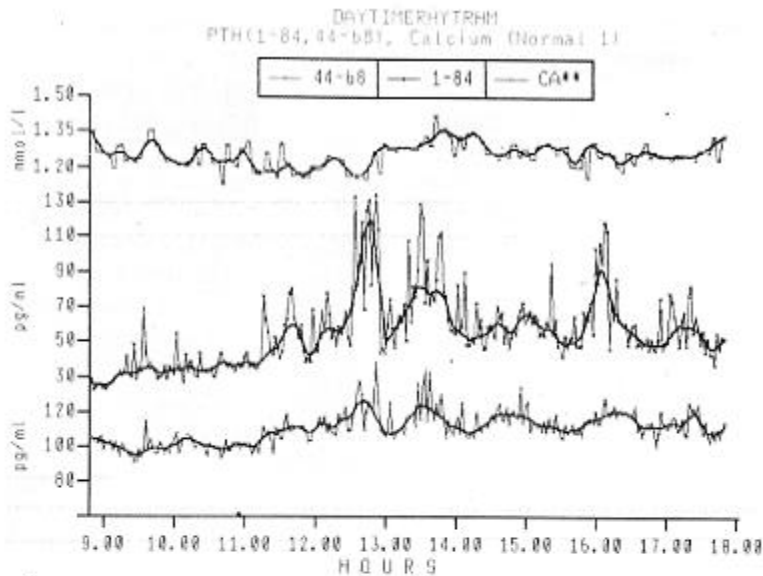
**Heart Rate Dynamics in Health and Disease:  
A Time Series Test**



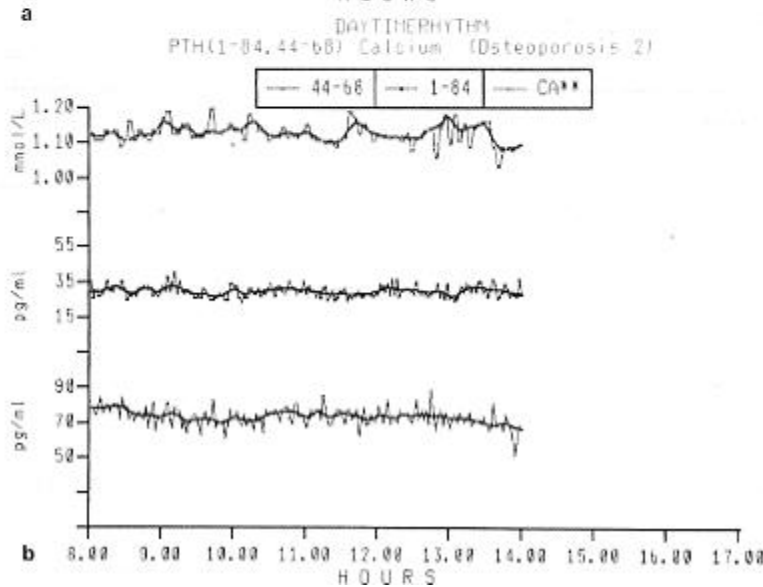
“A and C are from patients in sinus rhythm with severe congestive heart failure. D is from a subject with a cardiac arrhythmia, atrial fibrillation, which produces an erratic heart rate. The healthy record, B, far from a homeostatic constant state, is notable for its visually apparent nonstationarity and "patchiness." These features are related to fractal and nonlinear properties. Their breakdown in disease may be associated with the emergence of excessive regularity (A) and (C), or uncorrelated randomness (D). Of note in C is the presence of strongly periodic oscillations..., which are associated with Cheyne-Stokes breathing, a pathologic type of cyclic respiratory pattern. Quantifying and modelling the complexity of healthy variability, and detecting more subtle alterations with disease and aging, present major challenges in contemporary biomedicine.” (Goldberg et al 2002).

The following illustration of the calcium concentration shows, again, that the pathological state is associated with rigidity whereas the healthy process is

characterized by prominent fluctuations (Gerok 1990: 30). It shows the course of Calcium concentration in blood (above), of parathormone (middle) and its metabolite amino acid 44-68 (below).



a) Intense chaotic fluctuation of parathormone in the healthy



b) loss of nearly all oscillation in severe osteoporosis

This is in line with the finding that parathormone given continuously provokes bone loss, its intermittent administration fosters bone formation (Marx 2004b).

The third illustration (due to copyright reasons only in the original publication Ivanovas et al. 2007) shows the behaviour of a healthy family (probably no measurement but a guess). It demonstrates that ‘family balance’ is mainly a sort of a

disequilibrium. It only has to remain in a manageable range (Minuchin/Fishman 1981: 22). This contradicts the myth that functioning marriages are free of difficult problems (Roberto 1991: 446). Contrarily, families in equilibrium are regarded as endangered or ill as they are more inclined to become symptomatic in phases of transition (chap. 5.2).

## 6.5 Central and Distributed Control

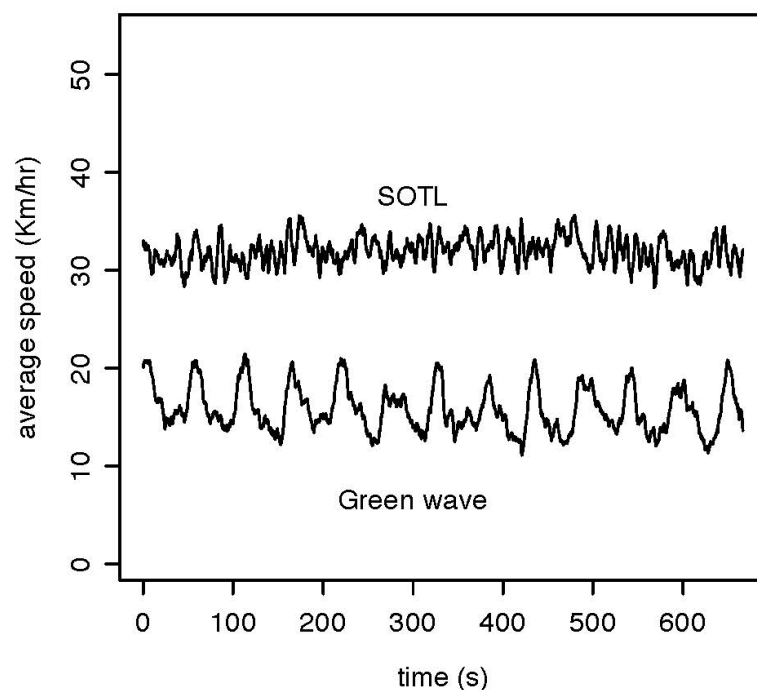
The reason why physiological processes are nonlinear and far from an equilibrium becomes immediately intelligible when the notion of control is introduced. In artificial systems two kinds of control are distinguished, *central* and *distributed control*. Systems with a central control are linear, homogeneous and have a modular hierarchy. Systems with distributed control are heterogeneous, nonlinear and self-organizing. The elements are able to find *dynamically* a new solution on their own (Gershenson 2007: 2).

This shall be demonstrated with the model of traffic lights (Gershenson 2005).

Usually traffic lights follow a fixed green wave mode where the lights change according to a given rhythm. This rhythm is either fixed or controlled by a central computer. Its program

considers the usual traffic volume. But such a program is not optimal as it does not take the real conditions into account. It is non-adaptive. All such programs fail after a football game or during Christmas rush. Then very often the police regulates the traffic.

This is approximately the principle of self-organising traffic lights



(SOTL). In this system, every traffic light is equipped with a certain set of rules and knows the traffic density of its own and the surrounding crossroads.

The traffic lights are in so far self-regulating, as they have to find the optimal solution on their own in co-operation with the surrounding traffic lights. No central decision maker exists. This network system performs much better than any fixed green wave method, at least in the computer simulation as it has not been applied yet. The results of the two approaches can be seen in the illustration (Gershenson 2005). It is evident that the oscillations of the self-organizing traffic lights are about the same as the oscillations in healthy physiological processes. The oscillations of the fixed green method shows a somehow similar rigidity of the pattern as seen in disease.

Furthermore, it is evident that physiological processes are self-regulating by nature, although there are influences from the centre, defining a certain goal.

The difference between systems with a central and a distributed control is the difference between trivial and nontrivial machines (chap. 4.5). "A homogeneous system will be easier to understand and control. A heterogeneous system will be able to cope with more complexity with less elements, and will be able to adapt more quickly to sudden changes. If there is a system of ten agents each able to solve ten tasks, a homogeneous system will be able to solve ten tasks robustly (if we do not consider combinations as new tasks). A fully heterogeneous system would be able to solve a hundred tasks, but it would be fragile if one agent failed. Heterogeneity also brings diversity, that can accelerate the speed of exploration, adaptation, and evolution, since different solutions can be sought in parallel. The diversity is also related to the amount of variety of perturbations that the system can cope with" (Gershenson 2007: 52-53).

There is a main difference in how these systems are controlled. Systems with a central control are easy to understand and easy to control. It is only necessary to change the chain of command. The higher in the hierarchy the change is performed the more effective is an intervention.

Self-organizing systems are different. This shall be demonstrated with a simple example. Breast-feeding is a recursive process (chap. 4.2) with a typical self-organisation: The mother provides milk in the quantity and to the time the baby needs it. This involves also *anticipation*, another trait of self-organisation. Thus, such systems have also to be 'cognitive' (Gershenson 2007: 51).

In breast-feeding typical strategies of central control are to be breast-feed every 4 hours. Often the baby is weighed before and after drinking. Then the drunken quantity

is compared with a list of reference values established in bottle-fed babies and the 'missing' quantity is given by the bottle.

If one regards breast-feeding as self-regulating a different form of control has to be performed. Control would be, for example, to provide the necessary relaxation of mother and child, or to support the mother in crises as in mastitis. Or in days when the demand of the baby suddenly rises it is helpful to breast-feed more often, but shorter, with the aim to instruct the organism of the mother to adapt to the new situation.

Some of the techniques to improve the adherence to breast-feeding are laid down in the *Ten Steps to Successful Breastfeeding* of (UNICEF). Mothers applying such principles were 6 times more likely to exclusively breastfeed their babies (Declercq et al. 2009).

In the context of self-organisation the notion of control has a totally different meaning than in central control. In 'complex adaptive systems' which are essentially unpredictable and uncontrollable (chap. 2.8). there is no classical control anymore. Control in this context means to influence the system to do what one wants. This is performed by so-called mediators. "A mediator arbitrates among the elements of a system, to minimize conflict, interferences and frictions; and to maximize cooperation and synergy" (Gershenson 2007: 41). A mediator might be traffic lights, a drug, an advice, a glass of Champaign or a bunch of flowers.

In our example of breast-feeding the notions of control differ in many ways. In the self-organizing approach the aim is to promote breast-feeding and to support this process as best as possible with different mediators. In the central control the aim is to bring the child to a certain weight and the mother is a mediator in doing so.

## 6.6 Hardening

Many deaths caused by Britain's winters (chap 2.1.d) are a result of a reduced adaptability. The death rates in the UK are higher than everywhere else in Europe, including the countries with much colder winters. A 5°C drop in temperature is associated with a 7% increase in admissions for stroke and a 12% increase in admissions for heart attack (Dobson 2004). After the winter 2003/2004 there was a lot of discussion on how to prevent such casualties. I would like to pick out one topic to demonstrate some important characteristics of robustness.

It had been proposed to heat all public buildings and even the bus stations during cold weather (Keatinge/Donaldson 2004). Of course, there are a lot of arguments against such a move. It would be rather expensive, would promote climate change, and both consequences (lack of money and a different climate) might even lead to a higher mortality. But the main argument in this context is that the heating of public areas does nothing to improve the robustness of the people. It might even diminish it. Bleuler who never heated the floors in his hospital and also kept the ward rooms on a quite low temperature, maintained that he had no deaths during the Spanish flu 1918/1919 whereas comparable institutions had quite a lot of casualties. He insisted that providing a frame of healthy conditions, that is, to promote robustness, is the best way to prevent and treat most diseases (Bleuler 1962: 54-56).

This natural way to improve robustness is called hardening (chap. 5.4.a). The benefit of hardening is not restricted to a defined trait as cold. It improves robustness in general. Body exercise, another way of improving robustness, prevents and heals a wide range of diseases (Blech 2007b) and does not only improve the function of the muscles and the bones. That is, in order to judge the therapeutic effects of an intervention, the higher levels of learning have to be taken into account (chap. 4.3). The exposure to cold weather is not as effective to prevent cold related deaths as heating, at least as a short term measure, but it might improve the adaptation to warm weather, as well. This is of some importance, as heat stroke is highly underdiagnosed (Bouchama/Knochel 2002), and the consequences of hot weather are normally only discussed during heat waves like in France where between August 4 and 18, 2003 about 15.000 people died (Poumadère et al 2005). That is, linear interventions like heating during cold or cooling during heat might prove to be effective in observational studies. But as they do not improve robustness or even might diminish it, they might lead to an increase of overall mortality.

It is crucial to understand this when the effects of a drug therapy shall be judged. Beta blockers are good for a lot of illnesses ranging from hypertension to glaucomas and states of agitation. However they increase rigidity, such that the ability to adapt to heat is decreased and heat stroke becomes more probable (Bouchama/Knochel 2002). As a consequence, all knowledge about the efficacy of beta blockers gained in specific trials is invalid in times of climate change with more hot summers, just to name a dramatic change of the context. On the other side: a therapy increasing robustness might be less effective than beta blockers in the specific context, but it

might lower all-cause mortality under changing weather conditions. But such developments cannot be observed under constant conditions.

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Our society has the tendency to avoid strong and changing stimuli. Everything is levelled through all kinds of interventions. Room temperature is constant. Nutrition is without strong tastes. Intense emotions are regarded as pathological and are immediately flattened with drugs. And all that seems to be somehow effective in a first order frame of observation, but it reduces robustness, is a kind of *weakening*. Having walked with groups of persons who never had left flat streets for decades, I have observed their difficulties to maintain balance when confronted with the uneven ground of goats' paths. But as soon as they started to move more smoothly they changed fundamentally. They even become able to think in a more complex way. This observation is supported by the findings that bodily exercise improves mental abilities (Aot et al 2004; Weuve et al 2004), protects against Alzheimer's disease (Schubert 2005) and even induces the growth of new brain cells (Wild 2005b). Even such a simple stimulus as vibrating insoles helps elder people to maintain balance more easily (Priplata et al 2003). However, I suppose that linear movements, as done in a fitness centre, are not as effective as walking under natural conditions. Fitness centres do not provide the incessant change of the stimulus. The linear stimulus might lead to a first order training. The continuous change of the stimulus leads to a second order learning, including anticipation of following movements, complex balancing etc. In the mountains nobody can read a newspaper or see television as sometimes seen in fitness centres.

The same is true for medicine. In the seventies of the last century there had been a tendency for programmed births. The time of delivery was freely chosen when all was prepared. Due to drug treatment everything was painless. A journal propagated the ideal that women even might read a newspaper giving birth.

This is a more prominent example of how medical practice tries to keep alterations in a small range whereas natural life expresses itself in a nonlinear and complex way.



## 6.7 Network Pathologies

Bateson, a forerunner in the study of network pathologies distinguished two main mechanisms:

- monotone change, continuous increase or decrease
- to fix a value of a variable (Bateson, 1988: 119).

A pathology of the first type (monotone change) is the symmetric and complementary schismogenesis (chap. 4.2). It is, for example, seen when the negative feedback mechanism between Th1 and Th2 is not interrupted. Experience tells us that it takes months or even years until chronic diseases arise after the occurrence of the first symptoms. Much quicker is the development in *Systemic Inflammatory Response Syndrome* (SIRS). An inflammatory cascade which might lead to sepsis within hours or days.

The second network pathology (fixing a variable) is more difficult to conceive. A first step towards its understanding is that a rigid subsystem might contribute to a decline in the robustness of the whole system. The subsystems of biological systems are potentially regenerative, that is, they prevent exponential runaways due to positive feedback-mechanisms. To be regenerative a subsystem (as the Th1/Th2 relation) has to be connected with other subsystems through cybernetic feedback loops. (Th1 and Th2 depend on interleukin-4 and interleukin-12 and so on). If in such a system, due to outer influences, one variable is held constant other variables are necessarily changed. Or as Ashby said: “To *prevent* change in the superficial variables is to *promote* change in the more profound” (cited in Bateson 1988: 120).

After some time such a change will spread through the whole system leading to a different homeostasis. Bateson defines such a change as a kind of learning (Bateson 1972: 440-447). As a consequence of this change positive feedback loops and unexpected runaways will occur after some time (Bateson 1972: 330-331).

This hypothesis implies that modern medicine which often aims at holding variables stable tends to induce network pathologies. As so often in medicine, such a hypothesis would be difficult to prove. An example of the correctness for this assumption is the analysis of polytraumatized soldiers of the battles of Trafalgar and Waterloo. It revealed that the survival rate was then about the same as in today's intensive care, despite all drugs and technology. The main reason for why current intensive care does

not prove better is the high incidence of sepsis (Singer/Glynn 2005), the typical example of a runaway (De la Rosa et al 2008).

Sepsis became one of the leading causes of death in the Western world in a time when also allergies, which are also nothing else than an exponential runaway, increase. That is, there must be mechanisms in these societies inducing network pathologies.

## 6.8 First Order Therapy and the Concept of Suppression

Signs, symptoms and dysregulations are usually regarded as something accidental with no deeper meaning. They only inform us about some disturbances, but they have no value as such. Thus, one might make them vanish without any disadvantage. This approach can be called *first order therapy*.

First order therapies are characterized by the disappearance of the symptoms although the structure producing the symptom remains unchanged. A first order intervention has often an immediate and clear-cut effect. This makes this kind of therapy so seductive. It pleases doctors and patients when they think of the moment only and not of the future (Bleuler: 38). A typical first order therapy are steroids in asthma. They relieve and prevent crises, but do not change the development of the disease (chap. 5.5.b).

It was first systemic psychotherapy which developed a more detailed theory about how a symptom might have a stabilizing effect for the whole system, something that has been illustrated with the asthmatic child tying the family together (chap. 5.2). In such a case the treatment of an 'identified patient', that is, on the level of the symptoms, might have implications for other family members and lead to a series of further, unforeseeable complications. This shall be illustrated with the following case: A 5 years old boy diagnosed with ADHD was sent to me by a psychologist. He was extremely nervous and agitated. What impressed me most was that whenever the child found something that attracted his interest for more than one minute (e.g., the tap), the father intervened and forced him to sit down. This provoked a new cycle of crying, irritation and nervousness. Although I understood the regulative mechanism maintaining the symptom, I made the mistake and treated the child. Indeed, after 3 months the boy was about 50% calmer and made good progress in his language development. But during this time the father came home rarely (officially out of business reasons) and finally left the family. After the father had left, the mother

stopped all therapies (with me and the psychologist), declared the child of having no problem at all, and from that day on mother and child lived closely together, even sharing the same bed. As I was told, the behaviour of the child deteriorated again. Although this development might be explained with other theories, as well, the therapy actually disturbed an inner stability and the situation got worse for probably all of the participants.

Such examples where the treatment of one sub-system leads to a disturbance of the whole system is often observed and is not restricted to 'psychological' diseases. A typical example is hormone replacement therapy which follows the pattern "works for symptoms but is not good for future health" (McPherson 2004). For example, women with migraine are less likely to develop breast cancer. Probably because of fluctuating estrogen levels (Mathes et al 2008). The treatment of migraine with a hormone replacement therapy might thus lead to a higher incidence of breast cancer.

A more disputable example is allergic disease where a slow development to more severe courses is observed. "First, asthma cases shot up, along with hay fever and other common allergic reactions, such as eczema. Then, pediatricians started seeing more children with food allergies. Now, experts are increasingly convinced that a suspected jump in lupus, multiple sclerosis and other afflictions caused by misfiring immune systems is real" (Stein 2008). Such a development can be regarded as a result of a continuous suppression.

Also everybody working in general practice or in the hospital knows such cases where during a treatment which started promisingly all of a sudden a whole series of 'unrelated' complications arise making no sense in the view of the previous positive course. This is a typical development of a network pathology. Everything seems to be smooth, but out of unclear reasons the situation deteriorates and becomes more and more complicated.

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The meaning of a symptom, that is, the semantic structure bringing forth this symptom is rarely addressed in medicine. It is mainly *Darwinian* or *evolutionary medicine* which investigates the semantics of medicine. Evolutionary medicine starts with the premise that robustness is the product of billions of generations (Lenski et al 2006) and every network found in biological research makes only sense in the frame of evolution (Weit et al 2007). For example, sickle-cell anaemia with a single copy of the defective gene confers immunity to malaria without causing sickle-cell anaemia

(Lewin 1993). Here one person has to pay the price for the benefit of many others.

Fever (discussed below) is a symptom where the same individual benefits.

From the evolutionary point of view, the intervention on the level of symptoms is seen rather critical. “A priori, it is unlikely that a cellular mechanism, which is the result of tens of thousands of years of evolution, will suddenly improve when an external 21st century chemical or other agent is introduced for completely unrelated reasons; such an agent is more likely to wreak rather than to prevent havoc” (Peto cited in Vandenbroucke 2004b).

Such first order therapies which lead to a deterioration of health have been called *suppression* by CAM. The term says: If a symptom is suppressed this might lead to more severe states not directly connected with the suppressed symptom. All this has been demonstrated above with the notions of rigidity and network pathology.

A practical example would be the suppression of gastric acid secretion by acid-suppressive therapy. This kind of therapy leads to a rise of the pH, such that viruses and bacteria persist in the stomach and the oesophagus which normally would have been eradicated. The result is an increased risk of community-acquired pneumonia (Laheij et al 2004) and other diseases (Dial et al 2006). As discussed earlier (chap. 2.6), a low iron level and anaemia are protective in inflammation. An intervention in order to correct the ‘deficit’ might cause more harm than good. That is, the symptom of anaemia has a meaning in a context of inflammation.

Another example is the treatment of fever with antipyretics. Normally fever is just regarded as an annoying side effect of many infectious and non-infectious diseases, only exhausting the patient. But evolutionary medicine sees it as important as all mammals produce it (Berlim/Abeche 2001). CAM even postulates negative developments through its suppression. Although not overwhelming, the evidence supporting this view is growing:

- Wagner Jauregg won 1927 the Nobel prize for medicine for his treatment of syphilis with artificial fever.
- Children with chicken pox given antipyretics recover slower and presented more symptoms in the 4<sup>th</sup> day than children given placebo (Doran et al 1989).
- Antipyretic therapy prolonged illness in subjects infected with influenza A (Plaisance et al 2000).
- Fever over 38,3 before the age of 1 leads to less allergic sensitivity at the age of 6 to 7 years (Williams et al 2004b).

- Children of Anthroposophic parents who give less or no antipyretics develop significantly fewer allergies (Flöistrup et al 2006).
- Fever promotes lymphocyte trafficking across high endothelial venules via an interleukin 6 *trans*-signaling mechanism, thus improving immune reaction (Chen et al 2006).
- Use of paracetamol in the first year of life and in later childhood, is associated with a higher risk of asthma, rhinoconjunctivitis, and eczema at age 6 to 7 years (Beasley et al 2008).
- The inhibition of cyclooxygenase (COX) enzymes reduced the humoral immune response to the infection with Lyme disease (*Borrelia burgdorferi*)(Blaho et al. 2009)

These findings allow not yet the conclusion that the suppression of fever might lead to exponential runaways, but there is enough evidence to seriously consider this possibility.

All sorts of medical therapies could and should be investigated under this aspect of first order therapy and suppression. What are the consequences of such a kind of interventions? A typical first order therapy was the rigorous control of blood sugar in type 2 diabetics. But this kind of ‘central control’ had no health benefit (first order therapy) or let even to more deaths (suppression) than a more loose approach (Kolata 2008), probably allowing a more distributed control.

## 6.9 Second Order Therapy is Change

Second order therapy intends a change of the organization bringing forth the symptom. The therapist is the advocate for the change (Roberto 1991: 459). Therapy in this sense has two different aims. One is the transition from one state to another and/or the ability to maintain a good inner balance under changing circumstances.

This is not achieved by compensating or correcting a sub-system.

In the social context of politics this is a well known phenomenon. Giving poor people money does not solve the problems unemployment poses. And – in long term – it is extremely costly. It is also not effective to punish drug dealers as long as the international supplies are untouched and the social climate remains the same. Such first order approaches never have any long term effects. Quite similar is the medical situation today, including its financial impact.

To improve the situation – in social and in health affairs – the structure has to be changed.

The structure, however, is not changed through lowering blood pressure or through the administration of antibiotics in recurrent tonsillitis. These interventions do not induce a change, or if, only by accident.

A change has to be a change of the operator and not of the operand (chap. 4.2). But this is hardly conceivable with a linear paradigm. Robustness and other conditions of learning of higher order are neither measurable and nor visible in simple cybernetic models (Bateson 1988: 37-46). Moreover, as rigidity does not turn out to be harmful under stable circumstances (under the circumstances of trials) the increase of robustness will seem to be less effective than forcing a patient into rigidity.

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The nature of therapy, the intention to influence a living organism (an autopoietic unit) can only be understood properly when the very basis of the biological organisation is properly understood. The quintessence is that *every therapy is a stimulus*. This is true for taking a cold shower in the morning, this is true for hormone replacement therapy and this is true for the resection of parts of the intestines in cancer or obesity. Or in the systemic terminology: In order to control nonlinear dynamic systems they have to be perturbed (Ashwin 2003). Or in the words of Bernard: An inner environment reacts to an outer stimulus (Bernard: 113-114). Fluoxetine, a selective serotonin reuptake inhibitor, does not work, because it corrects certain serotonin levels in the brain (chap. 2.3.d), but because it is a stimulus. It changes the metabolism of the brain and even its plasticity (Vetencour et al 2008). Perturbing an autopoietic unit, respectively stimulating an organism induces always a series of reactions determined by the inner structure and organization of the treated (if the system is not rigid) (chap. 4.10). This is, of course, also true for every advice. On a basic level there is no difference between a verbal and a chemical intervention (Blech 2007a). According to the principles of equifinality they might lead to the same results.

Balneology demonstrates best how through an unspecific stimulus a rigid pattern might be perturbed, such that inner rhythms start again, leading to a series of emergent phenomena including complications. Only when the balance is restored, symptoms vanish. It might take quite a long time, if the initial disturbance is severe.

## 6.10 Stimulus and Reaction – the Arndt-Schulz' Rule

The normally assumed linear relation between cause and effect<sup>18</sup> is, as we have seen, only a special case, observable under certain circumstances during a restricted period of time with no feedback mechanisms involved. As this is not the normal case most reactions are non-linear. Here some examples: In taking a cold bath the initial reaction is cold, the following reaction is warmth (Granichstaedten: 43). But staying too long in the cold bath changes the pattern and a beneficial effect becomes harmful (Granichstaedten: 44). Preißnitz observed that when a freezing person went in a warm bath and sweated the freezing stopped. When the person left the bath he froze again. Until here it is more or less a linear relationship. Freezing vanished, however, if the person was washed after the bath with a cold sponge (cited after Granichstaedten: 103). The paradox result is due to feedback mechanisms.

Nevertheless, it is still possible to make certain predictions. The *Arndt-Schulz' Rule* of naturopathy is such an attempt to model different reactional patterns. It exists in several versions. It says: *a small stimulus stimulates, a strong stimulus blocks or damages.*

Hydrotherapy works with stimulating effects, e.g., washing with a cold sponge induces a reaction towards warmth. Similar effects are also seen in systemic psychotherapy, specially in the strategic method (chap. 5.2.b).. Actually, this kind of reaction is a typical pattern seen in all cybernetic systems when the system tries to counter-balance a perturbation.

In the classical pharmacology this effect has been investigated in detail under the notion of *hormesis*. “Hormesis, a dose-response relationship phenomenon characterized by low-dose stimulation and high-dose inhibition, has been frequently observed in properly designed studies and is broadly generalizable as being independent of chemical/physical agent, biological model, and endpoint measured” (Calabrese/Baldwin 2003). The stimulating-blocking relation has been proved for many substances and is well established. For example, suramin which is effective in the treatment of prostate cancer promotes tumour cell growth in low doses (overview in Calabrese 2008).

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<sup>18</sup> Causality based on probabilities is not considered here, as they have no semantic relevance.

That a strong stimulus damages is obvious and needs no further discussion. The range of blocked reaction between stimulation and damage is nothing else than the rigidity discussed above. The general tendency in drug therapy is to remain in the range of blockage. First, because there is no theory of how to handle the changing pictures presented by a reaction of the organism. Such reactions are seen as disadvantageous. Second, the relation between drug administration and reaction becomes linear and trivial. Thus, an effective drug therapy has to have the ability to block the inner reactions, such that the system does not counter-react. But it has to be weak enough in order not to damage. That is, therapies based on the reaction towards a stimulus work on a total different level of human physiology than usual drug therapy making it difficult to compare the two.

Nevertheless, there is no fixed red line between stimulation, blockage and damage. The *phase transition* (chap 4.11) occurs according to the current condition of the person. Beta blockers might stimulate, block or harm depending on the inner and outer conditions, on the dosage, the duration, etc.

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In order to understand correctly how a change is induced by a stimulus, three preconditions have to be met:

- There must be a restricted number of stimuli such that a reaction can be attributed to the stimulus.
- Changes must be conceived as a process where different emerging states might follow each other which might or might not be connected to the initial state of the disease. The observed reactional pattern reveals to some degree the inner structure of the patient independent of the condition of the disease.
- The therapist must have a theory on possible reactional patterns in order to judge short and long term changes.

The first precondition is often met in orthodox medicine, although there is a tendency to combine treatments in an undisciplined way. This happens when for different sub-systems different uncorrelated or even antagonistic therapies are combined (Maesemeer et al 2003).

As a rule of thumb it can be said that therapists who use more drugs (or other kinds of interventions) individualize less, are more diagnose orientated and have no explicit theory of the process. Often the tensions between the practitioner and the hospital follow a similar pattern. Western hospitals are normally more diagnose biased. As a consequence they are more inclined to end up in a polypharmacy whereas the practitioner, knowing and understanding better the process of a patient, is more



inclined to prescribe few drugs. However, this seems to differ from country to country.

Practitioners are mostly well aware of the second precondition and see change as a process. Especially those practitioners who accompany patients over longer periods of time and even might know three or four generations of a family will often instinctively understand typical patterns of an individual or a family reaction.

Understanding disease as a process has many implications. One is:

*Do not disturb a process when the situation improves.*

From a processual point of view this is obvious. When an operation is under way leading to the desired goal, every intervention into this operation might disturb it and change the operator, such that medium and long-term results are less favourable.

Judgment might, however, be difficult, as crises are natural and common in the process of healing (Hammer: 44). Not later than here the lack of a theory to judge this process becomes obvious.

## **6.11 Initial deterioration**

The best known crisis is the *initial deterioration*. This is a worsening of the pre-existent symptoms or the emerging of other symptoms at the beginning of a therapy. The initial deterioration has already been discussed in different regards. It is the Hippocratic crisis (chap. 5.3.b), the complications in balneology that indicate the reinstatement of inner periodicity, or the excretion of substances from the body normally associated with increased symptoms (chap 5.4.d). Systemic psychotherapy expressively provokes symptoms by disturbing a balance in order to “disorganize rigid patterns of behavior, to activate anxiety and confusion surrounding the identified patient” (Roberto 461). „Change is viewed as an unsettling phenomenon that temporarily unbalances the marital relationship“ (Papp: 164). That is, an initial deterioration can be found on different levels, from the basic physiological regulation over neuro-muscular functions to social interactions. Some examples are:

- Most deaths during the influenza 1918 were due to an overreaction of the immune system (Kobasa et al 2004).
- In pharmacology this is known as the effect of the first dose, regularly seen in the therapy with  $\alpha$ -receptor-blockers.

- Feldenkrais who introduced a physiotherapy to alter rigid movement patterns observed that patients when they started to move differently had severe problems even with formerly simple movements as walking. They became clumsy and ineffective (Triebel-Thome 1989: 22-23). As soon as the new pattern is trained movements become smoother (first order effect) and the whole health situation improves (second order effect).

The initial deterioration is a typical systemic reaction. “If we find overshoot or false start – as is the case in many physiological phenomena – we may expect this to be a process in an open system with certain predictable mathematical characteristics” (von Bertalanffy: 160).

It can be explained in different ways: A balance, for the first time confronted with a strong and/or unknown stimulus, reacts with the typical overshoot. It takes some time until the learning process has led to a sufficient adaptation, such that a smooth reaction is the consequence (Ashby 1960).

Another explanation is that an adaptation is challenged and lifted. When we have an abscession, it does not hurt anymore after some time. The whole organism adapts to the situation. The incision in such an abscession disturbs this balance, causes more pain and generates different reactions until a new balance is reached. This is about the model of systemic psychotherapy for the change of a rigid pattern around the identified patient.

Of course there are also other explanations. But they all have in common that a system is confronted with a new situation to which it cannot react adequately at the beginning.

Initial deterioration is a first sign of a beginning adaptation and follows the pattern “harms short term – helps long term”. In orthodox drug therapy this is called *paradoxical pharmacology* and is found, for example, in the administration of beta blockers in congestive heart failure which “was long an absolute contra indication. From a linear point of view it was a miracle that it turned out to be helpful and became standard therapy. Bond is one of numerous researchers searching for an explanation for the beta blocker effect, and his work has led him to a startling conclusion. He is convinced that beta blockers are not a one-off, but an example of a more general phenomenon he has dubbed “paradoxical pharmacology”. In short, paradoxical pharmacology means using drugs that make your symptoms worse to make you better in the long run.

In the first few days or weeks of the treatment, patients do get worse and their risk of dying goes up. But after about two to three months, their hearts are stronger, their health has improved - and their life expectancy has risen dramatically.

But what's the mechanism? No one knows for sure. If asthmatics are given beta blockers, their airways constrict and they struggle to breathe, in much the same way that CHF patients get worse at first. What Bond wondered, and what no one had tested, was what happens when asthmatics are given low doses of beta blockers for a long period. Orthodox medicine suggests this is a bad idea, but paradoxical pharmacology says the opposite" (Martindale 2003).

Probably, the initial deterioration is much more common than normally thought. Currently the higher incidence of suicidal thoughts after the start of an antidepressive therapy is intensely discussed. This initial deterioration has been known for tricyclic antidepressive drugs for a long time, but it seems to occur in most other antidepressive drugs, as well (FDA Public health advisory 2004). The effect might also be seen in a lot of other drugs, but it is mostly mild or it is attributed to the patients' fear having read the side effects.

### **6.12 Biological hierarchies and individual prognosis**

Sometimes it is quite easy to understand when a therapy goes well. But often, especially in chronic diseases it seems to be difficult to judge all the changes occurring during the course of a therapy. This is even more difficult when the aim is not only to make symptoms go away (first order therapy), but when a fundamental change and an improvement of the robustness is intended. There might be an initial deterioration and inner rhythms might provoke sudden crises. But how can this be distinguished from a worsening of the situation? Even when the condition of the patient improves there might be some doubt whether the change is only a suppression which reduces robustness.

Most practitioners have a certain feeling for such processes. They possess a private theory, perceive patterns without a theoretical concept (chap. 4.9). This constitutes to a large extent what is called experience and intuition. The problem arises, however, when one tries to formulate a formal model of such developments, that is, when one tries to formulate the laws of an individual prognosis. According to my understanding this is only possible with a concept of '*biological hierarchies*' – and we are far from having such a concept (Redner 2008).

In technical systems the hierarchy is mostly *modular*. “The term *modular* is used to denote linearly ordered scalar hierarchies in which the characteristic scale of each successive level of the hierarchy is around one order of magnitude larger than the characteristic scale of the preceding level. The most basic examples are provided by number systems such as the decimal, with its successive units, tens, hundreds, thousands, etc. places....Modular hierarchies arise from the instance of an approximately linear relationship between the entropy and the number of equiprobable states of a system” (Smith J 2002).

The line of command in a linear and modular system is rather simple. The higher instance commands the lower one, just as in the army. Its hierarchy can be depicted in the form of a dendrogram. In contrast, a biological hierarchy is nonlinear and has recursive loops (Clauset et al. 2008). Physiology processes dissolve into cybernetic functions with no centre or decision maker left. Although hierarchical structures might be found in certain traits of sub-systems (TSH commands the thyroid gland), it makes no sense to say that TSH is higher in the hierarchy than thyroglobuline as the thyroid gland is cyclic organised. Moreover, the heart is not higher in the hierarchy than the lungs, and so on. Despite the fact that a lot of control mechanisms (by far not all) are triggered by centres in the brain, it is inappropriate to say that the brain is the instance of control, either. By that the terms ‘brain’ or ‘centre’ would become explanatory principles (chap. 3.3). The inner clock, for example, is generated on the level of the clock genes with different centres in the brain involved processing daylight, meals etc. (chap. 4.7). But the brain does not ‘control’ the inner clock in the modular meaning. That is, the *master clock* of the hypothalamic suprachiasmatic nucleus is not a master in a classical sense, it is more a moderator or facilitator.

Also cognition possesses a kind of hierarchical structure involving different parts of the brain. More general traits are processed by many neurons, more specific traits by fewer (Blech 2008a). In the recognition of the actress Halle Berry, many neurons are connected to the trait ‘human, woman’, fewer to the colours of her body and her hair and even fewer to characteristic movements, etc. Finally, there is one neuron always active in the perception of Halle Berry independent from the form or context she is perceived. This neuron represents the so-called *grandmother neuron* of neuroscience. But this single cell, although at the top of the cognition - pyramid of specificity (Blech

2008a) does not do the work of cognition, nor does it command. The whole pattern is necessary (Quiroga et al 2008).

Moreover, the usual ‘command model’ of the nervous system – saying that nerves interact through the release of neurotransmitters in synapses and thus somehow ‘command’ the following nerve – seems not to be accurate, either. There exists a major extrasynaptic interaction between nerves. Parallel nerves influence each other biochemically without synapses. Thus, the function of the brain seems to be much more chaotic than previously thought (Kukley et al 2007). Although this recent finding has not been verified by other groups, the spatial biochemical coupling of nerves makes a lot of sense in a non-modular understanding of organisation.

The appearance of such nonlinear processes can be modelled by self-organization. But there remains an ontological problem, or more accurate, an ontological unease. Is there a higher pattern, a principle or force behind this self-organization? This question is the root of many philosophical speculations. For some time the idea prevailed that the genome might play the role of a ‘master plan’. But the correlation between a certain trait and a gene is often as low as 8 % for most of today’s ‘genetically caused diseases’ (Paísan–Ruiz et al 2004). As the RNA is able to restore a gene deleted in the former generation (chap. 4.3) there is clearly a wider organisation ‘commanding’ in a certain sense, even the DNA.

To model such and other principles of physiological organisation an own class of ‘*biological hierarchies*’ is necessary (Smith J 2002), a model based on the principles of cybernetics and general systems theory. It has to be teleological. That is, it has to assume that the organisation has a purpose and that the observed processes are not accidental.<sup>19</sup> The main purpose is, of course, the autopoiesis of the living. Autopoiesis defines the reconstruction of the own structure and organisation as the central characteristic for living beings and implies a ‘downward causation’ as the necessary means to do so (chap. 4.8). This downward causalisation cannot have the form of a modular command. It is the equifinal ability of a system.

The teleological view implies that it is the ‘aim’ of the cybernetic circles to regulate the variables of the system against perturbations within a viability zone (Gershenson 2007: 2).

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<sup>19</sup> The theory of multiverses denies the purpose of a system. Based on quantum mechanics it supposes numerous parallel universes. Some of them are stable, some collapse. Nothing has a purpose, everything is accidental.

Thus, symptoms reveal the best possible reaction of the human under the given circumstances. Sometimes this 'best reaction' is harming like the lethal overreaction of the immune system in avian flu (chap 2.8.c), the occurrence of sepsis or an anaphylactic shock. In these cases an external stimulus is capable to induce the destruction of the whole organism as the metabolism cannot control anymore the always occurring tendency of cybernetic runaways (chap. 6.7).

But not every contact with a new germ and not every stimulus in allergy leads to death. This implies that the inner regulation is normally able to control such a process at a certain point. A simple swelling of the face after a wasp's sting reflects a better internal control than an anaphylactic shock. Flushing or sweating under stress is less a threat than a stomach ulcer. If someone after a painful experience develops diarrhoea the person is in a better equilibrium than someone falling into depression.

This simple reflection enables already to formulate a basic theory of biological hierarchies. *On the premise that the organism tries to maintain its integrity (in controlling overshoots) an organism is as healthier as it is able to control runaways early.* Nevertheless, runaways have to occur to a certain extend otherwise the organism is rigid, has no rhythms and is not able to compensate inner and outer fluctuations. In contrast, a crisis which remains in a manageable range is an indication of a functioning adaptation, and in chronic disease it is a sign of recovery demonstrating the reappearance of inner rhythms (chap. 5.3.b).

With such a blueprint the physician is able to judge certain developments in the course of a therapy. When a patient with gastritis and depression (with suicidal thoughts) does better with his stomach, but remains unchanged in his depressive state the situation is no improvement. But an amelioration on the emotional level accompanied by a worsening of the gastritis would be an improvement of the whole situation. As long as the stomach pain remains in a manageable range and is of limited duration it might be regarded as an initial deterioration. That is, fluctuations and long term consequences have to be taken into account, in order to judge a present situation. For example, is a viral disease with the occurrence of high fever for 2 or 3 days a good sign? Or is it better to have no fever at all, or to show only minor reactions (no 'specific symptoms') but to remain in a state of unease for weeks? From the point of view of adaptation the first choice is preferable.

That is, the physician has to understand the organism in its interconnectedness if he wants to judge the outcome of his intervention. He has to estimate in how far the

intervention is beneficial for the patient in his integrity. The simple vanishing of a sign or symptom does not inform about the general condition of the human (chap. 2.5.e, 5.3, 6.4, 6.6, 6.8).

Models of biological hierarchies taking the complexity of inner regulation into account exist already, at least in a rudimentary form. They are found in different methods of empirical medicine. Best known is the Hippocratic individual prognosis. Unfortunately there are only general guidelines which are not applicable to current medicine. More explicit are the models of acupuncture and homeopathy, which are presented in detail (Append. VI).

Such contributions of the empirical medicine might give an idea of how an individual prognosis and biological hierarchies could be modelled, how fluctuations and inner rhythms occur in the process of an individual therapy.

What would be the benefit of such a model? It would help to improve the general situation, the adaptability and robustness of the patient. It would enable the physician to understand which patient really profits from a therapy. That is, treatment could be much more individual. The current approach allows often only the statement that a patient has a 10% probability to benefit of a given treatment, the so-called NNT (the 'number needed to treat', chap. 2.1.f). Such a model might even be able to detect impending side effects of a therapy quite early. Experience and theoretical concepts like synergetics (chap. 4.11) suggest that the deterioration of the whole system has early first signs which could be detected with an appropriate model.

### **6.13 Control and Requisite Variety**

What is medicine good for? What is its aim? In order to come to some final conclusion it is necessary to refer to this basic question. The Hippocratic oath takes a stand on this, although it is more concerned with the social position of the physician. In the modern and slightly adapted form, in the *Declaration of Genova*, the oath says: "The health of my patient will be my first consideration" (Hippocratic oath 2008). I personally prefer the more strict statement of Hahnemann. He claims in the first aphorism of his 'Organon': "The physician's high and *only* mission is to restore the sick to health, to cure, as it is termed" (Hahnemann: 90). Some consequences of this point of view, to which probably everybody will agree, are elaborated in the footnote to this aphorism. Hahnemann says there:

“His mission is not, however, to construct so-called systems, by interweaving empty speculations and hypotheses concerning the internal essential nature of the vital processes and the mode in which diseases originate in the interior of the organism, (whereon so many physicians have hitherto ambitiously wasted their talents and their time); nor is it to attempt to give countless explanations regarding the phenomena in diseases and their proximate cause (which must ever remain concealed), wrapped in unintelligible words and an inflated abstract mode of expression, which should sound very learned in order to astonish the ignorant - whilst sick humanity sighs in vain for aid. Of such learned reveries (to which the name of theoretic medicine is given, and for which special professorships are instituted) we have had quite enough, and it is now high time that all who call themselves physicians should at length cease to deceive suffering mankind with mere talk, and begin now, instead, for once to act, that is, really to help and to cure.”

Although this statement is rather old, it refers to certain issues, still valid. As said before (chap. 2.1.g), reductionism resembles Celsus ‘theoretical medicine’ (appendix II). Reductionist research regards all kinds of single mechanisms as the ‘cause’ of a disease, including genetical, pathophysiological or biochemical traits. This implies that the correction or the manipulation of these traits will lead to health. It is a kind of bottom-up approach. In contrast, Hippocrates and Hahnemann come from an empirical medicine which is more top-down oriented. But such distinctions as bottom-up vs. top-down or theoretical vs. empirical remain somehow vague. Much more precise is the distinction between central and distributed control (chap. 6.5).

The central approach gives the physician a more important position. He becomes the main figure deciding on the end points to be reached. But in how far does the physician (the observer) understand what is necessary for the human and his organism? Or in other words: how smart is the human organism and how smart is the physician?

This crucial question has been formulated in the *law of requisite variety* (chap. 4.7). It says that in order to control a system the observing system has to have the same complexity as the observed system. This implies that the physician has to have tools of observation which correspond in their complexity to the complexity of the human. But this is, as we all know, not the case. Actually it is an unattainable ideal. So what can be done with the complexity and variety encountered in medicine?

Reductionism, as its name says, reduces variety, and it does it on different levels. First, observation is reduced to reproducible mechanisms or to statistically significant probabilities. Second, the variety of therapeutic means is reduced in excluding most non-specific measures, even the therapeutic relationship (chap. 6.1). Third, the variety in the patient is reduced by holding variables more or less stable. Research under such



conditions does not correspond to the nonlinear nature of the human. Results are valid, but it is a little bit like hunting Easter eggs oneself has hidden (chap. 2.5.h). According to the law of requisite variety it would be necessary to increase the variety of the observer. This is rarely done. Reductionist scientists often show a certain concern that allowing a different sight would imply that ‘anything goes’. But this is not necessarily the case. There is a middle way between the Scylla of reductionism and the Charybdis of arbitrariness. Concepts like ‘optimal variety’ (Paritsis 1992: 35-39) might be appropriate. That is, scientific strictness is also possible in complexity. Or better: Only the variety of epistemological tools is scientific when it comes to complex situations as in medicine.

Every medical problem can be described in different ways, from different points of view, on different levels. This has been demonstrated with osteoporosis (chap. 4.6), asthma (chap. 5.5.b) and with the relation alcohol-health (chap. 2.1.c). No formal model has been provided, yet, to connect all the different findings and theories. However, this would be necessary to overcome the autistic-undisciplined thinking. In my opinion the following preconditions have to be met, if one tries to establish a correct model of therapy:

- First, it is necessary to understand the context of the problem and of a possible intervention (chap. 3.6).
- Second, one has to formalize the level of abstractions (chap. 3.2).
- Third, it has to be clear what kind of control is intended (chap. 6.5).
- Fourth, the consequences of each intended intervention onto all levels has to be assessed, or at least assumed.
- Fifth, the *individual* control of effectiveness has to be established according to clearly defined principles.

Such a model would be a rather ambitious project. It has to involve an understanding of robustness in general and of an individual prognosis in special. The following structure tries to provide a first tool to think about such notions as context or level of abstraction in a medical frame. It cannot be called a model, as it is linear and thus not appropriate to describe the observed processes.

The most important factor for health is probably what is called *lifestyle* (Universitat Autònoma de Barcelona 2008). For example, over half of deaths in women from chronic diseases such as cancer and heart disease could be avoided if they would

never smoke, keep their weight in check, take exercise and eat a healthy diet low in red meat and trans-fats (Dam et al 2008, Forman et al. 2009). And obesity is as harmful as smoking (Prospective Studies Collaboration 2009). Lifestyle concerns the whole person and a therapeutic intervention is not limited to one level. It can't be, although the theory might suggest something else from time to time. But even in those cases, or especially in those cases, a clear logical structure might be helpful to overlook the different possibilities of intervention.<sup>20</sup> This shall be demonstrated with the asthmatic disease.

a) local pathology

Asthma can be seen as a local problem of the lungs with bronchoconstriction, inflammation, hypersecretion of Becher cells, a disturbed remodelling process (chap. 5.5.c), and so on. Interventions on this level (local steroids) improve the symptoms, often quickly and impressingly. However, these therapies do not change the further development of the disease (chap. 5.5.c). They are a first order therapy or a suppression of symptoms (chap. 6.8). A stimulating and not suppressing therapy would be the inhalation of sea water, as performed in several spas, the relaxation training of the lungs, or a hypnotherapy with the intention to improve breathing.

b) mediators and receptors

Mast cells release histamine, cysteinyl leukotrienes and cytokines producing an inflammatory cascade leading to the asthmatic attack. But “it is hard to believe that the very large and rather selectively distributed number of mast cells in normal, uninflamed, non-infected, non-traumatized mammalian skin or mucosal tissue simply hanging around there lazily day and night, just wait for the odd allergen or parasite-associated antigen to come by so the mast cell can finally swing into action” (Maurer et al 2003). Mast cells have a meaning. For example, they regulate tissue repair (Conneely et al 2004). That is, as soon as the local regulation is taken into account the meaning of this regulation, the semantic context (chap. 3.1), has to be understood. The level of mediators and receptors is no longer restricted to the lungs. It is associated with the whole picture of the atopic disease.

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<sup>20</sup> It is always arguable, or better impossible, to attribute a certain intervention or stimulus to one of the here introduced categories. The aim of this model is more to give a certain feeling for a hierarchy, for the therapeutic pluralism.

Specific interventions on this level (like antihistamines) have a much wider impact, as mediators and receptors are usually widely distributed with quite different equifinal functions.

It is rather difficult to attribute an unspecific treatment to this level. May be the 'neural therapy' (chap. 4.8), a massage using the segmental neural interaction or the SHU-MU interventions of acupuncture (chap. 5.6.c) could be seen as an attempt to improve the function and regulation on the mediator/receptor level.

### c) general cybernetic regulation

Asthma is a type 2 disease, an imbalance of Th1 and Th2 helper cells. This is the level of the general immune defence. All kind of influences affect this function, including infections or the bacterial and viral flora (chap. 2.8). Interventions interfering with this level are vaccinations, probiotics, antibiotics, antipyretics, etc. The relation between therapeutic measures and the observed effect is often not so clear.

Antipyretics change the set point of the parameter 'body temperature', but their impact on the function of the immune system has never been assessed appropriately (chap. 6.8). Moreover, antipyretics do a lot of other jobs besides lowering body temperature. For example, they might change apoptosis and inner rhythms (chap. 5.3.a). Also antibiotics do not kill only defined specific germs. They interfere with the bacterial flora more generally and might also change the viral flora. The occurrence of *Candida albicans* after an antibiotic treatment is rather common and might induce a further allergisation (Savolainen et al 1993), although the data for this assumption are not overwhelming.

Considering the former finding that living systems are nonlinear and operate far from the equilibrium (chap. 6.4) it might be expected that the Th1/Th2 relation is not static but constantly shifting around a certain ratio. That is, a slight tendency to allergy and auto-aggression might be transient and in line with a healthy function of the immune system.

'Specific interventions' are not possible on the level of the cybernetic regulation, on the level of the ecological system. The system will react and the reaction is nonlinear, unpredictable and uncontrollable (chap. 2.8; 4.2). Interventions in order to change a certain function and/or a set point are prone to induce network pathologies as long as they fix a variable (chap. 6.7) and do not intend to stimulate a reaction. This has been

seen with parathormone which provokes bone loss when given continuously, but fosters bone formation when given intermittently (chap. 6.4).

Another example of a network pathology through the intervention into a cybernetic cycle was a trial with the substance TGN1412 which influences T cell function. This therapy lead to a massive cytokine storm and a multiorgan failure in all six healthy human volunteers (StClair 2008), a typical exponential runaway. Similar events might be expected or at least cannot be excluded with all other attempts to influence a cybernetic function in a linear way. These effects might not be as obvious if the development of the network pathology is rather slow.

#### d) inner environment

The whole inner environment is a further extension of the level of abstraction. It is not concerned with the performance of a certain task like the immune system. Its aim is the autopoiesis (chap. 4.8). The level of autopoiesis is beyond the specific concept and asthma or atopic disease can hardly be described on this level. In this view they are neither an impairment of breathing nor of the immune defence. A definition on this level has to involve statements about network pathologies and about the meaning of genetics and epigenetics. Thus, no specific treatment can be designed for the inner environment, in special. This does not mean that therapies do not work on this level. They do. In influencing sub-systems a therapy has always a general effect, mostly more than the theory suggests. A therapy with beta blockers, for example, might change the adaptation fundamentally (chap. 6.6).

As a consequence, interventions on this level are necessarily unspecific. A typical example would be the nutrition (chap. 2.8.a) or a therapy with probiotics (chap. 2.8.b). Another therapeutic strategy, which came into the focus of research lately, is physical exercise. A lot of detailed findings show that physical exercise is good for nearly ever function in the body. Even the neurogenesis in the brain is stimulated (overview Blech 2007b). Rather famous became a study showing that in stable coronary artery disease physical exercise is superior to stent therapy (Hambrecht et al 2004). Of course, exercise is also helpful in asthma (Juvonen et al 2008, Williams et al 2008). But the effects of such a therapeutic intervention cannot be assessed in measuring a certain trait or surrogate parameter. Just as it is impossible to assess the therapeutic power of choir singing by measuring cortisol and fibrogen levels (chap. 5.4.a). Every

intervention has to be evaluated in its relation to the whole function, in relation to robustness and autopoiesis (chap. 6.2).

Many 'unspecific' methods of CAM have explicitly the aim to induce robustness and to facilitate distributed control, most apparently in balneology. On the contrary, orthodox medicine is rarely concerned with this issue, which is a major handicap of the current scientific concept.

e) psycho-social context

This is the level of the human in his context. Many disciplines have been concerned with the human interaction, its emotional implications and its influence onto health. A forerunner in this field of 'psychoimmunology' was Norman Cousins (1915-1990). He provided a lot of examples how and in which way interhuman relations are able to improve or worsen the course of a disease (Cousins 1985, 1990). But Cousins' approach was human and not scientific. This had been an obstacle in dealing with the scientific community in the sixties and seventies of the last century. It is still a handicap today. In the first place, reductionist research considers human factors as unspecific (chap. 5.4.b). Moreover, reductionism excludes 'psycho-social' factors as they are so numerous that the results of one research group often cannot be confirmed by another group with a slightly different angle of observation, a dilemma of psychosomatic medicine ever since. Psychosomatic medicine often relied on the description of single cases (Uexküll 1986) emphasising sometimes the beauty of a theory and not its effectiveness (Haley 1973: 12), which can hardly be established with statistical methods (chap. 5.7).

As a result, interhuman factors are neglected in the medical discourse and in the medical education. It is only consequent that medical students lose their idealism (chap. 3.10) and their empathy during their studies (Shapiro 2008).

Anyhow, the relevance of the psycho-social level has been generally underestimated. But to understand its importance, a different approach is necessary. This shall be demonstrated with the following example: A lot of diseases is somehow 'contagious'. They spread along social networks. For obesity it has been shown that this kind of network relation is much more important than any 'biological cause' such as genetic disposition (Christakis et al 2007). The same is true for suicide (Bohannon 2006). But also many other diseases seem to follow a similar pattern (Dworaschk 2008), quitting smoking (Christakis/Fowler 2008) and happiness (Fowler/Christakis 2008) included.

The therapeutic impact of such a finding is immediately clear. In order to improve the health of a patient, beneficial networks have to be enforced and the influence of harming networks have to be repressed. A rather straightforward application of this strategy is the method of the weight watchers. Their success in combating obesity is only partly due to the proposed diet (which would represent a therapy of the local or mediator level). The weight watchers strongly rely on the social interaction with weekly meetings, public weighing, mutual support, financial fine, etc. All this helps to achieve a self-set goal (Weight Watchers 2008).

Another example is the therapy of anorexia nervosa with means of structural psychotherapy. Here the aim is to change the family structure and interaction. The caloric treatment of the individual is reserved to life-threatening situations (Minuchin et al 1978). That is, the treatment is less concerned with the pathological trait. The same is true for psychotherapeutic methods which improve the family relation of an asthmatic child supposed to hold the family together (chap. 5.2; 6.8). But also choir singing might reveal its therapeutic power in asthma neither by changing cortisol levels (chap. 5.4.a), nor by promoting a better breathing, but by influencing the social networks and by creating friendships which seem to have a major health protecting influence (Parker-Pope 2009b, Shively et al. 2009).

That is, the effect of interventions on this level is rather indirect and hardly describable with a 'specific' mould. These interventions are less concerned with the manipulation of 'causes'. They are more concerned with solutions (chap. 5.2) which might have nothing to do with what has been defined as a cause before.

#### f) ethical values and religiosity

A further extension of the frame of abstraction is the question of general ethical and religious values. This subject plays no role in medicine (Mohr 2006). Spiritual values are rarely addressed as such, although newer research addresses the (mostly positive) influence of religion onto health (Nagourney 2008). Religious questions normally appear only in a negative context, when, for example, people refuse life prolonging therapies (Winter et al 2007), or when Jehovah's witnesses deny blood transfusion. From a Christian point of view a simple intactness and functioning is no aim as such. Jesus was rather radical about that. In Matthew 5:30 he says: "And if thy right hand offend thee, cut it off, and cast *it* from thee: for it is profitable for thee that one of thy members should perish, and not *that* thy whole body should be cast into

hell.” Although this might be seen as a metaphorical statement, it shows that every action has to refer to a higher goal. This is true for all religions, although their aims and concerns might differ. But even an atheistic view does not lead to pure egoism. All social research shows that altruism is a basic trait in evolution (University of Leicester 2008). A medicine abstaining from ethical considerations is endangered to become an extension of a simple consumerism.

The physician is continuously confronted with questions concerning the meaning of life. This is not only the case in suicidal patients, but also in all kind of mental disease. Is the aim of the therapy to make the ill an average Joe or Jane? According to which principles is the patient accompanied through the maze of life? This issue is rather prominent in artists where the vicinity of creativity and psychotic experience is well established (Jamison 1993). The list of people who have been diagnosed as manic-depressive (appendix IV) reads like a who’s who of Western art (Simon 1995: 192). Mostly it is beneficial for the artists when treated (Zuger 2008a). But the way we as physicians see and support the creativity of our patients plays an important role, even if we do not treat a lot of van Goghs or Pollocks. Creativity is one of the most important tools in the inner development of every person (Petzold/Orth 1996). The question, every physician faces is, in how far (s)he is concerned with such issues like inner development. How important was Proust’s asthma for his creativity (Miller 1956)?

The matter is not different in depression. A major depression has to be treated, but minor depressions might have some meaning in the life of the patient (Wolpert 2008). It might be the motor for compassion (appendix IV) or even of spiritual fulfilment. The physician faces akin challenges in patients with cancer, after cardiac infarction, in obesity and in practically in all problems of life. For families with asthmatic children the question might be crucial in how far it is necessary to change their life-style or the place of living (chap. 6.1). Such questions arise in every regimen, in every ‘therapy by order’ (chap. 5.4.b) a physician establishes. Otherwise the outcome will be poor. The adherence to a certain treatment depends much on its meaning for a certain person (Park 2007). The *Alcoholics Anonymous* are rather successful in treating alcoholism and they stress extremely the importance of spiritual values. However, mostly it is difficult to assess the health effects of religious/spiritual practice (Park 2007), as they do not translate into a certain defined behaviour.

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This structure, ranging from very specific to very unspecific interventions, suggests certain traits which have been addressed in one way or another throughout this thesis. Some of them might be summarized as follows:

There is some evidence that

- the more specific a therapy is, the more it is at risk to be only a first order therapy with a higher danger of inducing rigidity (exception: strategic therapies like parathormone given discontinuously)
- the more specific an intervention is, the more obvious is the relation of cause and effect
- the more unspecific a therapy is, the more equifinal mechanisms are induced
- the higher the level of organisation, the less it is possible to assess a relation between cause and effect
- the higher the level of organisation, the more structural an intervention has to be

The main problem is in how far such implications can be proved or disproved. The more equifinal processes are involved, the more difficult is efficacy control (chap. 5.7). Specific interventions might be highly effective but do not contribute necessarily to longevity (chap. 2.2). Instead, most important factors for longevity like a healthy lifestyle, a Mediterranean diet and regular physical activity (Universitat Autònoma de Barcelona 2008) never perform as effective in the framework of EBM. One has to be aware of this possibility, which is nothing else than the simple wisdom of the incompleteness theorem (chap. 3.3) that truth and proof are something different.

## **6.14 The therapeutic attitude**

The health of my patient will be my first consideration

(Hippocratic oath)

In order to improve the health of a patient, medicine has to deal with all aspects of the human. It is neither more scientific, nor more medical and probably not more effective to be concerned only with one aspect. Medicine is about healing, about organisation, about robustness, about evolvability, about the meaning of life. The



physician has to provide the necessary requisite variety. It would be unscientific not to do so.

In order to deal with the ‘higher’ levels and layers concerning human and social values and interactions it is more important to read Dostojewski than the newest issue of the *Lancet*. Thus, the ‘narrative medicine movement’ (chap. 1) has a much a wider impact than only the improvement of the communicative skills. It represents a part of medical practice which can be defined as the *attitude* of the physician. This term comprises many aspects like affect, cognition, and behaviour (Zimbardo/Ebbesen: 7). It is strongly connected to all the value decisions a physician continuously makes (chap. 6.1), to the notion of power (chap. 4.6), to the interhuman relationship. Many examples for how the attitude influences our medical practice have been provided. Here a last one: Children with ADHD are often treated with drugs, when parenting would be as effective or even a better solution (Constantini 2006). The best proof is that children after divorce are more often treated with Ritalin (Strohschein 2007), although a good supporting structure would be more important (Ohio State University 2008). In fact, a whole range of educational problems is treated with antidepressants (Jureidini et al 2004) or antipsychotic drugs (Olfson et al 2006), often with doubtful results (Jureidini et al 2004). Such developments have far reaching consequences. First, they tend to decrease the robustness of the treated individual. Second, they teach the ‘social lesson’ that solutions can be achieved by drugs (US National Drug Control Policy 2008). Third, they prevent that other solutions, other states (chap. 4.11) can be found. Fourth, through social and epigenetical learning such imposed alterations might lead to a change of the human adaptation even for generations. Hence, the central value decision in every treatment is: What kind of control is intended? A central or distributed control? Is drug treatment considered as front-ranging or adjuvant? This is an undecidable question (chap. 3.4) which translates in succession into a whole range of decidable questions. Just as it is impossible not to communicate (chap. 3.7) it is impossible that the physician’s attitude does not influence the therapy. Moreover, in the field of the autistic-undisciplined thinking two physicians might come to a totally different strategy to promote health, even in using the same data (Zuger 2008b).

In this aspect the “*Advice to young doctors from members of the editorial board of the British Medical Journal*” (appendix I) is not only an accumulation of unrelated

recommendations but a reminder of the pivotal concerns of medicine. This requires an independent thinking, a 'fearless speech' (Papadimos/Murray 2008).

Some decades ago there was a humanistic movement in psychotherapy, a movement not related to one method but obliged to the basic principles of humanity. It saw itself as a third force in psychology between the one-sidedness of psychoanalysis and behaviouristic psychology. Its main values were (Revenstorf 1982):

- individual experience and not theorizing and objectivity,
- non-reductionism stressing the basic human abilities of creativity and self-actualisation,
- meaningfulness, that is, that psychological concepts and research have to be based on the question whether the results make sense for human existence,
- dignity, the aim to support those forces in humans that enable a dignified life.

Although this is a psychological manifest, the same values could serve as a foundation for all human therapy. They are as true in diabetes as in rheumatic arthritis or depression. Being aware of the basic human values and the fact that every therapy is first of all a value decision, a physician has a considerable variety of options.

If the physician clearly perceives what is to be cured in diseases, that is to say, in every individual case of disease (*knowledge of disease, indication*), if he clearly perceives what is curative in medicines, that is to say, in each individual medicine (*knowledge of medicinal powers*), and if he knows how to adapt, according to clearly defined principles, what is curative in medicines to what he has discovered to be undoubtedly morbid in the patient, so that the recovery must ensue – to adapt it, as well in respect to the suitability of the medicine most appropriate according to its mode of action to the case before him (*choice of the remedy, the medicine indicated*), as also in respect to the exact mode of preparation and quantity of a required (*proper dose*), and the proper period for repeating the dose; – if, finally, he knows the obstacles to recovery in each case and is aware how to remove them, so that the restoration may be permanent: *then he understands how to treat judiciously and rationally, and he is a true practitioner of the healing art.*

Samuel Hahnemann, Organon of Medicine, § 3

## Appendix I

### Advice to young doctors from members of the editorial board of the British Medical Journal

- Learn to cope with uncertainty
- Challenge what you are taught, especially if it seems inconsistent or incoherent
- Regard your knowledge with humility
- Be yourself at all times
- Enjoy yourself
- Try to practise medicine with the same ethics and principles you believed in when you started medical school
- Never be afraid to admit your ignorance
- Medicine is not only clinical work but is also concerned with relationships, team work, systems, communication skills, research, publishing, and critical appraisal
- Treat your patients with the same care and respect as if they were your loved friends or family
- Cure is not what everyone is expecting from you: your patients and their families may be just seeking support, a friendly hand, a caring soul
- Outside the family there are no closer ties than between doctors and patients
- Don't believe what you read in medical journals and newspapers
- Aim at knowing how to learn, how to get useful medical information, and how to critically assess information
- The first 10 times you do anything—present a patient, put in an intravenous catheter, sew up a laceration—will be difficult, so get through the first 10 times as quickly as possible
- Although you should not be afraid to say "I don't know" when appropriate, also do not be afraid to be wrong
- Cherish every rotation during your training, even if you do not intend to pursue that specialty, because you are getting to do things and share experiences that are special
- When you have a bad day because you are tired, stressed, overworked, and underappreciated, never forget that things are much worse for the person on the cold end of the stethoscope. Your day may be lousy, but you don't have pancreatic cancer

(Smith 2003f)

### **More advice to young doctors from members of the *BMJ's* editorial board**

- Don't ever complain to house staff about being tired
- Knowledge without the appropriate interpersonal skills cannot benefit patients, and knowledge without the right attitude can be dangerous
- You have to go on learning all your life, and a healthy sense of ignorance is a saving grace
- There's something for everyone in medicine, but finding the best career for you may take a while—and that's fine
- Hold yourself to the highest standards of honesty and professional integrity; admit when you are wrong; learn from your mistakes
- Try to stay humble; listen closely to patients. The answers are very often buried in what they tell you
- All doctors are or will be patients
- The more certain you are, the less you know
- Knowledge is knowing that tomatoes are a fruit; wisdom is knowing not to put them in a fruit salad
- To enjoy good health eat what pleases you, but in moderation; work hard; do not tell lies, cheat others, or gossip; have the courage to forgive; and treat everyone as your nearest and dearest
- What doctors consider to be good for patients is not necessarily what patients consider to be good for them
- Never under any circumstance lose your sense of humour and your smiles
- Collaboration lies at the heart of modern medicine
- Stick to it
- Becoming a doctor is the most interesting and satisfying career there is

(British Medical Journal 2003d).

## Appendix II

### Celsus: *On Medicine*

excerpt of the **Proomeium**<sup>21</sup>

During the same times the Art of Medicine was divided into three parts : one being that which cures through diet, another through medicaments, and the third by the hand. The Greeks termed the first *Διαιτηκή* the second *Φαρμακευτική*, the third *Χειρουργία*. But of that part which cures diseases by diet those who were by far the most famous authorities, endeavouring to go more deeply into things, claimed for themselves also a knowledge of nature, without which it seemed that the Art of Medicine would be stunted and weak. After them first of all Serapion, declaring that this kind of reasoning method was in no way pertinent to Medicine, based it only upon practice and upon experience. To him followed Apollonius and Glaucias, and somewhat later Heraclides of Tarentum, and other men of no small note, who in accordance with what they professed called themselves Empirici (or Experimentalists). Thus this Art of Medicine which treats by diet was also divided into two parts, some claiming an Art based upon speculation, others on practice alone. But after those mentioned above no one troubled about anything except what tradition had handed down to him until Asclepiades changed in large measure the way of curing. Of his successors, Themison, late in life, diverged from Asclepiades in some respects. And it is through these men in particular that this health-giving profession of ours has grown up.

Since of the divisions of the Art of Medicine, the one which heals diseases, as it is the most difficult, is also the most famous, we must speak about it first. And because there is a primary difference of opinion, some holding that the sole knowledge necessary is derived from experience, others propounding that practice is not efficient enough except after acquiring a reasoned knowledge of human bodies and of nature, I must indicate which are the principal statements on either side, so that I may the more easily interpose my own opinion also.

They, then, who profess a reasoned theory of medicine propound as requisites, first, a knowledge of hidden causes involving diseases, next, of evident causes, after these of natural actions also, and lastly of the internal parts.

They term hidden, the causes concerning which inquiry is made into the principles composing our bodies, what makes for and what against health. For they believe it impossible for one who is ignorant of the origin of diseases to learn how to treat them suitably. They say that it does not admit of doubt that there is need for differences in treatment, if, as certain of the professors of philosophy have stated, some excess, or some deficiency, among the four elements, creates adverse health ; or, if all the fault is in the humours, as was the view of Herophilus; or in the breath, according to Hippocrates; or if blood is transfused into those blood-vessels which are fitted for pneuma, and excites inflammation which the Greeks term *Φλεγμόνη*, and that inflammation effects such a disturbance as there is in fever, which was taught by Erasistratus; or if little bodies by being brought to a standstill in passing through invisible pores block the passage, as Asclepiades contended - his will be the right way of treatment, who has not failed to see

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<sup>21</sup> Reprinted electronically by permission of the publishers and the Trustees of the Loeb Classical Library from CELSUS: VOLUME I, Loeb Classical Library ® Volume 292, translated by W. G. Spencer, pp. 7-27, Cambridge, Mass.: Harvard University Press, Copyright © 1935 by the President and Fellows of Harvard College. The Loeb Classical Library ® is a registered trademark of the President and Fellows of Harvard College.

the primary origin of the cause. They do not deny that experience is also necessary; but they say it is impossible to arrive at what should be done unless through some course of reasoning. For the older men, they say, did not cram the sick anyhow, but reasoned out what might be especially suitable, and then put to the test of experience what conjecture of a sort had previously led up to. Again they say that it makes no matter whether by now most remedies have been well explored already ... if, nevertheless, they started from a reasoned theory; and that in fact this has also been done in many instances. Frequently, too, novel classes of disease occur about which hitherto practice has disclosed nothing, and so it is necessary to consider how such have commenced, without which no one among mortals can possibly find out whether this rather than that remedy should be used; this is the reason why they investigate the occult causes.

But they call evident those causes, concerning which they inquire, as to whether heat or cold, hunger or surfeit, or such like, has brought about the commencement of the disease; for they say that he will be the one to counter the malady who is not ignorant of its origin.

Further, they term natural actions of the body, those by which we draw in and emit breath, take in and digest food and drink, as also those actions through which food and drink are distributed into every part of the members. Moreover, they also inquire why our blood-vessels now subside, now swell up; what is the explanation of sleep and wakefulness: for without knowledge of these they hold that no one can encounter or remedy the diseases which spring up in connexion with them. Among these natural actions digestion seems of most importance, so they give it their chief attention. Some following Erasistratus hold that in the belly the food is ground up; others, following Plistonius, a pupil of Praxagoras, that it putrefies; others believe with Hippocrates, that the food is cooked up by heat. In addition there are the followers of Asclepiades, who propound that all such notions are vain and superfluous, that there is no concoction at all, but that the material is transmitted throughout the body, crude as swallowed. And on these points there is little agreement indeed among them; but what does follow is that a different food is to be given to patients according as this or that view is true. For if it is ground up inside, that food should be selected which can be ground up the most readily; if it putrefies, that which does so most expeditiously; if heat concocts it, that which most excites heat. But none of these points need be inquired into if there be no concoction but such things be taken which persist most in the state in which they were when swallowed. In the same way, when breathing is laboured, when sleep or wakefulness disturbs, they deem him able to remedy it who has understood beforehand how these same natural actions happen. Moreover, as pains, and also various kinds of diseases, arise in the more internal parts, they hold that no one can apply remedies for these who is ignorant about the parts themselves; hence it becomes necessary to lay open the bodies of the dead and to scrutinize their viscera and intestines. They hold that Herophilus and Erasistratus did this in the best way by far, when they laid open men whilst alive - criminals received out of prison from the kings - and whilst these were still breathing, observed parts which beforehand nature had concealed, their position, colour, shape, size, arrangement, hardness, softness, smoothness, relation, processes and depressions of each, and whether any part is inserted into or is received into another. For when pain occurs internally, neither is it possible for one to learn what hurts the patient, unless he has acquainted himself with the position of each organ or intestine; nor can a diseased portion of the body be treated by one who does not know what that portion is. When a man's viscera are exposed in a wound, he who is ignorant of the colour of a part in health may be unable to recognize which part is intact, and which part damaged; thus he cannot even relieve the damaged part. External remedies too can be applied more aptly by one

acquainted with the position, shape and size of the internal organs, and like reasonings hold good in all the instances mentioned above. Nor is it, as most people say, cruel that in the execution of criminals, and but a few of them, we should seek remedies for innocent people of all future ages.

On the other hand, those who are called "Empirici" because they have experience, do indeed accept evident causes as necessary; but they contend that inquiry about obscure causes and natural actions is superfluous, because nature is not to be comprehended. That nature cannot be comprehended is in fact patent, they say, from the disagreement among those who discuss such matters; for on this question there is no agreement, either among professors of philosophy or among actual medical practitioners. Why, then, should anyone believe rather in Hippocrates than in Herophilus, why in him rather than in Asclepiades? If one wants to be guided by reasoning, they go on, the reasoning of all of them can appear not improbable; if by method of treatment, all of them have restored sick folk to health: therefore one ought not to derogate from anyone's credit, either in argument or in authority. Even philosophers would have become the greatest of medical practitioners, if reasoning from theory could have made them so; as it is, they have words in plenty, and no knowledge of healing at all. They also say that the methods of practice differ according to the nature of localities, and that one method is required in Rome, another in Egypt, another in Gaul; but that if the causes which produce diseases were everywhere the same, the same remedies should be used everywhere; that often, too, the causes are apparent, as, for example, of ophthalmia, or of wounds, yet such causes do not disclose the treatment: that if the evident cause does not supply the knowledge, much less can a cause which is in doubt yield it. Since, therefore, the cause is as uncertain as it is incomprehensible, protection is to be sought rather from the ascertained and explored, as in all the rest of the Arts, that is, from what experience has taught in the actual course of treatment: for even a farmer, or a pilot, is made not by disputation but by practice. That such speculations are not pertinent to the Art of Medicine may be learned from the fact that men may hold different opinions on these matters, yet conduct their patients to recovery all the same. This has happened, not because they deduced lines of healing from obscure causes, nor from the natural actions, concerning which different opinions were held, but from experiences of what had previously succeeded. Even in its beginnings, they add, the Art of Medicine was not deduced from such questionings, but from experience; for of the sick who were without doctors, some in the first days of illness, longing for food, took it forthwith; others, owing to distaste, abstained; and the illness was more alleviated in those who abstained. Again, some partook of food whilst actually under the fever, some a little before, others after its remission, and it went best with those who did so after the fever had ended; and similarly some at the beginning adopted at once a rather full diet, others a scanty one, and those were made worse who had eaten plentifully. When this and the like happened day after day, careful men noted what generally answered the better, and then began to prescribe the same for their patients. Thus sprang up the Art of Medicine, which, from the frequent recovery of some and the death of others, distinguished between the pernicious and the salutary.

It was afterwards, they proceed, when the remedies had already been discovered, that men began to discuss the reasons for them: the Art of Medicine was not a discovery following upon reasoning, but after the discovery of the remedy, the reason for it was sought out. They ask, too, does reasoning teach the same as experience? If the same, it was needless; if something else, then it was even opposed to it: nevertheless, at first remedies had to be explored with the greatest care; now, however, they have been explored already; there were neither new sorts of diseases to be found out, nor was a novel remedy wanted. For even if there happened nowadays some unknown form of



malady, nevertheless the practitioner had not to theorize over obscure matters, but straightway would see to which disease it came nearest, then would make trial of remedies similar to those which have succeeded often in a kindred affection, and so through its similarities find help; that was not to say that a practitioner had no need to take counsel, and that an irrational animal was capable of exhibiting this art, but that these conjectures about concealed matters are of no concern because it does not matter what produces the disease but what relieves it; nor does it matter how digestion takes place, but what is best digested, whether concoction comes about from this cause or that, and whether the process is concoction or merely distribution. We had no need to inquire in what way we breathe, but what relieves laboured breathing; not what may move the blood-vessels, but what the various kinds of movements signify. All this was to be learnt through experiences; and in all theorizing over a subject it is possible to argue on either side, and so cleverness and fluency may get the best of it; it is not, however, by eloquence but by remedies that diseases are treated. A man of few words who learns by practice to discern well, would make an altogether better practitioner than he who, unpractised, overcultivates his tongue.

Now the matters just referred to they deem to be superfluous; but what remains, cruel as well, to cut into the belly and chest of men whilst still alive, and to impose upon the Art which presides over human safety someone's death, and that too in the most atrocious way. Especially is this true when, of things which are sought for with so much violence, some can be learnt not at all, others can be learnt even without a crime. For when the body had been laid open, colour, smoothness, softness, hardness and all similars would not be such as they were when the body was untouched ; because bodies, even when uninjured, yet often change in appearance, they note, from fear, pain, want of food, indigestion, weariness and a thousand other mediocre affections; it is much more likely that the more internal parts, which are far softer, and to which the very light is something novel, should under the most severe of woundings, in fact mangling, undergo changes. Nor is anything more foolish, they say, than to suppose that whatever the condition of the part of a man's body in life, it will also be the same when he is dying, nay, when he is already dead; for the belly indeed, which is of less importance, can be laid open with the man still breathing; but as soon as the knife really penetrates to the chest, by cutting through the transverse septum, a sort of membrane which divides the upper from the lower parts (the Greeks call it *διάφραγμα*), the man loses his life at once: so it is only when the man is dead that the chest and any of the viscera come into the view of the medical murderer, and they are necessarily those of a dead, not of a living man. It follows, therefore, that the medical man just plays the cut-throat, not that he learns what our viscera are like when we are alive. If, however, there be anything to be observed whilst a man is still breathing, chance often presents it to the view of those treating him. For sometimes a gladiator in the arena, or a soldier in battle, or a traveller who has been set upon by robbers, is so wounded that some or other interior part is exposed in one man or another. Thus, they say, an observant practitioner learns to recognize site, position, arrangement, shape and such like, not when slaughtering, but whilst striving for health; and he learns in the course of a work of mercy, what others would come to know by means of dire cruelty. That for these reasons, since most things are altered in the dead, some hold that even the dissection of the dead is unnecessary; although not cruel, it is none the less nasty; but all that is possible to come to know in the living, the actual treatment exhibits.

Since all these questions have been discussed often by practitioners, in many volumes and in large and contentious disputations, and the discussion continues, it remains to add such views as may seem nearest the truth. These are neither wholly in accord with one

opinion or another, nor exceedingly at variance with both, but hold a sort of intermediate place between divers sentiments, a thing which may be observed in most controversies when men seek impartially for truth, as in the present case. For as regards the causes which either favour health or excite disease, how breath is drawn in or food distributed, not even philosophers attain to full knowledge, but seek it out by conjecture. But where there is no certain knowledge about a thing, mere opinion about it cannot find a certain remedy.

And it is true that nothing adds more to a really rational treatment than experience. Although, therefore, many things, which are not strictly pertinent to the Arts as such, are yet helpful by stimulating the minds of those who practise them, so also this contemplation of the nature of things, although it does not make a practitioner, yet renders him more apt and perfected in the Art of Medicine. And it is probable that Hippocrates, Erasistratus and certain others, who were not content to busy themselves over fevers and ulcerations, but also to some extent searched into the nature of things, did not by this become practitioners, but by this became better practitioners. But reasoning is necessary to the Art of Medicine, not only when dealing with obscure causes, or natural actions, but often . . . for it is an art based on conjecture. However, in many cases not only does conjecture fail, but experience as well; and at times, neither fever, nor appetite, nor sleep follow their customary course. More rarely, yet now and again, a disease itself is new. That this does not happen is manifestly untrue, for in our time a lady, from whose genitals flesh had prolapsed and become gangrenous, died in the course of a few hours, whilst practitioners of the highest standing found out neither the class of malady nor a remedy. I conclude that they attempted nothing because no one was willing to risk a conjecture of his own in the case of a distinguished personage, for fear that he might seem to have killed, if he did not save her. . . . (Celsus: 7-27).

## Appendix III

### The Viet Nam veteran - a case of Milton Erickson

*The case demonstrates the limitations of a logical system not taking signs and signification into account. There are even no tools to describe this process except of meaningless explanatory principles such as 'hypnosis', 'suggestion', 'psychological' etc.*

Jim was a high school graduate and a very idealistic young man. Grade was a classmate, and also a very idealistic young woman.

Jim was drafted for the war in Viet Nam. He was serving in Viet Nam in noncombat duty. In a truck accident, he had his spinal column broken and his spinal cord severed. He returned to the Veteran's Hospital in a wheelchair suffering from convulsive pain about every five minutes, night and day. The Veteran's Administration operated on Jim to relieve him of his pain, but that didn't work. In fact, that made his pain worse. And then they operated on him a second time, and that served no purpose at all. They were planning on doing a third operation to relieve him of that convulsive pain every five minutes.

And somewhere along the way, Jim or Grade, or both, heard about me. They told the chief surgeon that they were going to see me for hypnosis about pain. So the surgeon took them into his office. For one whole hour, he told them that hypnosis was nonsense, and witchcraft, black magic, and sorcery. He described me as a charlatan, a faker, an ignoramus. In fact, he didn't like hypnosis, and he didn't like me. He considered it awfully wrong of them even to think about hypnosis.

And Jim still had his convulsions of pain every five minutes.

And Gracie was very sympathetic, and despite that hour-long lecture against hypnosis, they decided to come see me.

Gracie wheeled Jim's wheelchair into my office. The looks on the faces of both were the looks of fear, of unhappy expectation, the look of resentment, a faint look of hopefulness, a look of antagonism and a look of wariness. They were certainly not in good emotional state to listen to me. But they told me about the back injury and the two operations, and how the highly respectable chief surgeon at the Veteran's Hospital had said that hypnosis was black magic, witchcraft and the work of a charlatan. So I told Gracie, "You stand over there on that rug. (Erickson points.) Stand up straight; look straight ahead, your hands beside you. And, Jim, here is a heavy oak

cane. I used it when I walked. It's a heavy oak cane. You take it. If you see me doing anything you don't like, clobber me with it." (To Siegfried.) Clobber means "hit."

(Everyone laughs.)

Siegfried: With the piece of wood?

E: An oak cane, a long stick that you use when you walk.

Jim took the cane and gripped it very tightly in his hand, and he watched me. Then I told Gracie, "Gracie, I'm going to do something to you that you won't like—to which you will object very strenuously. I will stop doing it just as soon as you go into a hypnotic trance. Now you don't know what hypnosis is, nor what a hypnotic trance is, but in the back of your mind you *know* what it is. So you stand there and if I do something offensive to you, you can know that I'll stop just as soon as you are in a trance."

I lifted the point of my bamboo cane and began sliding it back and forth at the point of cleavage, trying to expose her breasts. And Gracie slowly closed her eyes and was in a deep trance. I put my cane down and Jim was watching me. He couldn't take his eyes off me. I said to Gracie, "Where is your hometown? What high school did you go to? Name some of your classmates. How do you like Arizona weather?" A few things like that. And Gracie answered with her eyes shut. I reached out and took hold of her arm and lifted it up and left it cataleptic. (Erickson lifts his arm and leaves it cataleptic.)

I turned to Jim and said, "You heard Gracie speaking to me. Now you talk to her." I reached out and put Grade's hand down. (Erickson puts his hand down.) And Jim said, "Gracie? Gracie? Gracie?!" And he turned to me and said, "She doesn't hear me." I said, "That's right, Jim. She is in a deep trance, she can't hear you. Ask her any question you want to. She won't hear you." So he asked a few more questions and got never a quiver of movement.

Then I said, "Gracie, how many students were there in your high school?" She told me. I reached out with one finger and lifted her hand up again, and with one finger I put it down again. (Erickson gestures with his left arm.) I told Jim, "Lift Grade's hand." He reached over and started to lift it, but I had put Grade's hand beside her and it was cataleptic. Jim couldn't pull it away from her side. I reached out and lifted her hand with one finger and told Jim to put it down and he tried. Grade's muscles contracted and she kept her hand where it was. (Erickson demonstrates with his hand.)

I took my time doing all of this. And then I said, "Grade, stay in a deep trance, but open your eyes and walk from that rug to over there to that chair." (Erickson points.) "And when you sit down in the chair, close your eyes. Then awaken, open your eyes and start wondering."

Grade sat down, closed her eyes, opened them, and said, "How did I get here? I was over there on that rug. How did I get here?" Jim said, "You walked over there." Grade said, "I did not. I was standing over there on that rug. How did I get here?" Jim tried to tell her, but Grade disputed it. "I was standing on the rug. How did I get here?" I let that argument go on for a while.

Then I told Jim, "Look up at the clock. What time is it?" He said, "It's twenty-five past nine." I said, "That's right. You came in at nine o'clock and you had a convulsion of pain. You haven't had any more convulsions." Jim said, "That's right," and went into a convulsion of pain. I said, "How did you like that pain? You were free of it for 20 minutes." He said, "I didn't like it and I don't want it to happen again." I said, "I don't blame you. Now Jim, you look at Gracie. Grade, you look at Jim. And, Gracie, as you look at Jim you will go slowly into a deep trance. And as you look at Gracie going into a deep trance, Jim, you will go into a trance." And within a minute's time, they were both in a deep trance.

I pointed out to him, "Jim, pain is a warning that the body gives. It is like an alarm clock that awakens you in the morning. You awaken, and you turn off the alarm. Then you proceed with preparing for the day's work." I said, "All right Jim, and you listen, Gracie. Jim, when you feel pain beginning, you just turn off the alarm, and let your body go about the day's work of comfort, and anything else that needs to be done. And listen well to me Gracie, because Jim doesn't have to see me all the time. Since you are his wife, when Jim feels pain coming on, he can ask you to sit down. He can look at you and you can look at him, and you both will go into a trance. After you are in a trance, Gracie, you can repeat some of the things I am going to teach you right *now*." And so I gave Gracie full instructions on how to talk to Jim.

So, I saw them a few more times to make certain that they had really learned. After the first meeting, they went back to the hospital and demanded to see the chief surgeon. For about an hour, they gave him a lecture about hypnosis. They told him how wrong he was, how very, very wrong. Jim said, "You don't see me having any pain convulsions, and you wanted to do a useless operation. You really ought to be

ashamed of yourself. You should learn something about hypnosis." And at the next meeting of my class at Phoenix College, the surgeon came in and took notes.

A few days later, Jim and Gracie left the hospital and went to their home in Arizona. And the government, because Jim was disabled, furnished him with money to build a home. Jim, working in his wheelchair, helped build a great part of that home. The government furnished him with a tractor and 15 acres of land. Jim learned how to get out of his wheelchair and up onto the tractor seat, so he plows his own land.

At first, every two months, they would drive to Phoenix because Jim thought about hypnosis like he thought about anti-tetanus. He would ask me for a "booster shot." I would give him a booster shot. But pretty soon, Jim started showing up only every three months, then twice a year. Then they had a happy idea. They could telephone me. Jim would call me up and say, "Gracie is on the extension line. I think I need a booster." And so I would say, "Are you sitting down, Gracie?" She would say, "Yes." I would say, "All right, I'm going to hang up. You and Jim stay in a trance for 15 minutes. You say whatever is necessary to Jim, and Jim, you will listen to what Gracie says. At the end of 15 minutes, you can awaken."

Zeig JF (1980): *A teaching seminar with Milton H. Erickson*, Brunner/Mazel, New York: 175-179

## Appendix IV

### Genetical Behaviourism<sup>22</sup>

In recent years there has been an increasing number of publications proving that behaviour has a genomic cause. The *Science* magazine classified the understanding of this relation as the second-ranked breakthrough of the year 2003 with the promising title “Decoding mental illness” (Science news and editorial staffs 2003). But this issue is not new. It has been discussed in psychiatry for many years in the search for the cause of schizophrenia - today correlated with a variety of genes (Harrison & Owen, 2003). However, if we open a medical journal, especially *Molecular Psychiatry*, we find that a lot of behavioural patterns reduced to genetic causes. Here are some arbitrary examples:

- There is a strong connection between ADHD (attention-deficit hyperactivity disorder – diagnosed according DSM-IV) and the allele 4-repeat of the IL-1 RA gene, coding Interleukin-1 antagonists, whereas the allele 2-repeat is associated with a reduced risk (Segman et al, 2002.).
- There is a significant linkage of ‘simple phobia’ to chromosome 14 markers (Gelernter et al., 2003).
- The Grp-gen is regulating ‘Pavlovian learned fear’ by influencing the lateral nucleus of the amygdala (Shumyatsky et al., 2002).
- Individuals with one or two copies of the short (s-) allele of the 5-HTT gene are much more likely to develop depression than individuals with the long (l-) allele when confronted with emotional stressors between the age of 21-26 (Caspi et al., 2003).

Of course this is the resumption of the old discussion of whether behaviour is inherited or acquired. Already in 1960s fierce quarrels erupted on this subject. Results have been forged (Di Trocchio, 1993), professors have been beaten, in short: real life roared around this issue.

The question whether traits are inherited or acquired is not only difficult to answer. It is, due to recursive processes, impossible to answer. Bateson replaced this question

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<sup>22</sup> This is the abbreviated version of the publication Ivanovas G (2005): Trivial and non-trivial machines in the animal and in man, *Kybernetes* 34; 3-4: 508-520

by: “Up to what logical level is learning effective and down to what level does genetics play a determinative or partly effective role?”

The ant *Pheidole kingi instabilis* is characterized by a large variety of forms. The morphology of each animal depends mainly on its function. The whole population is interconnected by exchanging stomach content, a process called *trophylaxis*. In this way some substances are distributed among the whole population. As a result, some information about the composition and situation of the population is provided to all ants. The group has a certain kind of ‘consciousness’ of itself. Removing the queen provokes a reaction in the other ants: The workers feed a special nutrition to some larva in order to raise a new queen (Maturana/Varela).

In an article with the remarkable title »Identification of a Major Gene Regulating Complex Social Behavior« Krieger and Ross show that a difference in the Gp-9 genotype of the fire ant (*Solenopsis invicta*) is responsible whether one or several queens are raised (Krieger/Ross, 2002)

These short examples of the world of ants are sufficient to show the complexity of our issue: The status of a queen is acquired, not inherited. However, it is genetically determined that a queen has to exist. This genetic determination is to be found in the workers and not in the queen herself. Whether or not a larva becomes a queen depends on environmental influences and is stochastic.

It is amusing to directly translate this into human behaviour: It is not very likely for a person to become the leader of a country. One doesn’t need any special genes, one must only be fed properly.

The more serious consequences of this short, but not superficial look at the organisation of ants shows that there is no clear distinction between genetics and environment, that genetic determinations are sometimes more easily changed than acquired characteristics, that a broad social context can be responsible for the morphologic expression of a genetic possibility, etc.

If we look for comparable situations in mankind we find it, e. g., in the acquisition of language. Up to the age of 12-14 the syntax of (native) language is easily learned. If this first acquisition does not happen (i. e. in the deaf), it is impossible to recapture it later (Sacks, 1989). It is, without doubt, a critical age. Afterwards (or even earlier) someone is French, English, German or Greek. Noteworthy is that the prognosis of ADHD beyond this critical age is considered as bad (Lösslein & Eike-Beth, 2000). It is foremost a question of definition to call it a morphological consolidation or a



reduced plasticity of the brain. Adolescence does not only close a chapter. It also opens up a new one with other topics and with an increased neuronal plasticity for them (McCrone 2000). Social and sexual themes become predominant. Also schizophrenia is known not to start until adolescence. However, “clinical studies show that patients with schizophrenia manifest minor behavioural abnormalities in childhood even before the onset of schizophrenia” (Sawa & Kamiya 2003).

What happens in adolescence? Are some genes switched on and suddenly produce schizophrenia? Or do they become more important as minor changes have already been noticed earlier? Does the environment prevent the development of a coherent personality by incoherent communication (Bateson, 1972; Selvini Palazzoli et al., 1989)? But why after adolescence? Do we have to live with such vague terms such as ‘multi-factoral disease’, actually confessing ignorance?

The structural connection between genes and behaviour can best be described with the concepts of trivial and non-trivial machines.

*Imprinting* as first described by Konrad Lorenz (Lorenz, 1949) is a trivial machine:

The baby duckling will follow the first moving object it sees at the moment it slips out of the egg. This is normally the mother. Therefore, throughout its childhood it walks behind its mother. If it sees first Konrad Lorenz it will follow Konrad Lorenz, and if it first sees a moving football, it will spend a lot of his lifetime walking behind a moving football. Imprinting is a trivial machine with just one recursive loop. Not understanding this recursive loop will lead to the following fallacy: Imprinting is genetically determined. If behaviour is (falsely) defined as ‘following the mother’, there are these unexpected situations when it follows Konrad Lorenz. In this case the genes will not code for the expected behaviour. This is called *penetrance*. If the correlation gene-behaviour is high as in some kinds of haemophilia, the penetrance of the gene is high. If the correlation is low, then the penetrance is low. Low penetrance is normally expected when the maternal and paternal genes differ or when a behaviour is coded by many genes, thus producing a non-trivial machine.

What should be demonstrated here is that a seeming ‘low penetrance’ might be nothing else but the misunderstanding of one single recursive loop. In the duckling the behaviour ‘following a moving object’ is 100% genetic, the behaviour ‘following the mother’ is 100% acquired. Through, with a slight change in the definition, the inner logic is turned upside down, although the observed process remains the same.

But recursivity can also be misunderstood the other way round.

The raising of the queen in *Pheidole kingi instabilis* or the queens in *Solenopsis invicta* is a trivial machine. Nevertheless, from the viewpoint of the larva (“Who is going to be queen?”) it is a stochastic process that cannot be predicted. But the result is determined. The environment only regulates the formalities. There are no recursive loops. If there are several queens as in the species *Formica fusa*, the workers prefer to feed the brood (larva and queen) they are genetically more related to (Hannonen & Sundström 2003). This is not a recursive process by itself, because it does not change the behaviour of the queen, the workers and the larva. A recursive effect could only be seen through generations, if according to environmental conditions the reproductive share of one queen increases. This preference of the own brood was called nepotism. But nepotism (‘one hand washes the other’) is a highly recursive process, which continuously changes the behaviour of all people concerned. It might have a stabilizing effect in chaotic social situations (e. g., post-war) or a destabilising effect in stable conditions (mafia), it might lead the partners to the highest positions or to prison. The outcome is not foreseeable. It is as non-trivial just as the cooperation of scientists.

Heinz von Foerster always maintained that man is a non-trivial machine. His well-known example is that of a child answering the question “How much is  $2 \times 2$ ?” with “green”. Such a child, he said, would be sent immediately to a ‘trivializing institution’ thereafter giving the ‘right’ answer (von Foerster, 1999).

What was initially thought of as more anecdotal - von Foerster, as he told me, was unaware of the clinical picture of *synaesthetics* - turns out to be an exact description of how complex behaviour is trivialized. *Synaesthetics* is a state of perception where different sensual qualities are inseparably connected, shapes have colours, names have odours etc. One of these children during first grade indeed answered the question “How much is  $1 + 1$ ?” with “dark green” (Schneider 2003).

*Synaesthetics* is said to be quite common if not ubiquitous in early childhood before a more social perception is adopted (Hackenbroch 2000, Motluk 2004). This corresponds to the finding that the infant’s ability to discriminate among native speech sounds improves, whereas the same ability to discriminate among foreign speech sounds decreases (Kuhl et al. 2003). Similarly 6-month old infants are equally good in recognizing facial identity in humans and non-human primates. Something they have lost at the age of nine months (Pascalis et al. 2002).

Early childhood is characterized by a great variety of non-trivial, non-linear, non-formed behaviour that brings forth a stable social behaviour only through recursive interaction. This is accompanied by a stabilization of neuronal brain organisation. Biology does not discriminate between structure and function. Function changes the structure and structure shapes function. The genomic foundation only provides a very wide framework. Trivialization is the necessary condition for the development of social behaviour.

However, this organization is not fixed, as brain research of the last years showed (Gross 2000). It even might resume to some extent, e.g., after stroke (Kluska et al 2004).

This corresponds to the observation of Keeney that synaesthetic perception can be achieved by certain rituals (Keeney 2005).

Perception can hardly be called 'learned' or acquired. But its organization is much more flexible than we had expected. It is based on recursive social interaction.

Such recursive processes involving structure and function have a major impact on the outcome of genomic research on behaviour. The reliability of this kind of research has been proven to be low. The results of one group can rarely be confirmed by another group. Normally technical problems (Colhoun et al. 2003) or study design (Hattersley/McCarthy 2005) are held responsible. But the misunderstanding of recursive processes is another main factor.

One hint in that direction is that the correlation genome-behaviour is higher in smaller studies than in larger studies (Ioannidis et al 2003). In general, smaller groups are more homogenous in their behaviour than large populations. What does this mean in terms of recursivity?

If we take a small traditional village in the Cretan mountains, the behaviour of the inhabitants, sexual self-image, expression of aggression, etc. is very homogenous, at least to the foreign observer. This is an acquired pattern as such a person changes behaviour going to the city, especially if this is done in early life. The situation is similar as in language. According to Chomsky (chap. 4.2) we could postulate a 'faculty of behaviour in a broader sense', that is, the possibility to interact, to acquire a language, to express emotions, to mate etc., and 'a faculty of behaviour in a narrower sense', that is, the human possibility to produce a large variety of social contexts. In contrary to the duckling who has a restricted number of recursive loops, humans have many recursive loops that sometimes are restricted after adolescence.

Investigating a small population creates the delusion that a certain kind of behaviour is stable out of biological reasons. In such a stable situation the correlation gene/behaviour might be quite high. However, it is only an effect of the frame of observation.

This is comparable to laboratory research, where variable factors are held stable in order to investigate some traits of a system. The relation, however, will be true under these circumstances only. Unexpected behaviour will arise over and over and it will be labelled with expressions as 'low penetrance of genes'.

The other similarity to laboratory research is that all studies investigate the relation of *one* gene for a defined behaviour. For example, different studies show a relationship between the genome and schizophrenia, but always for a different gene (Harrison/Owen 2003). As the studies are designed to find a trivial relation of cause and effect, they can only provide tendencies. But, since recursive processes are involved, they cannot show any kind of structural interconnection between genome and behaviour.

The problems, which are arising as a consequence shall be demonstrated with a study on depression (Caspi et al., 2003): Individuals with the s-allele of the 5-HTT gene only become depressed when confronted with emotional stressors. They develop twice as often depression after having suffered from four and more stressing events. The study investigated stressors like employment, financial, housing, health and relationship. It was found that the tendency to develop depression increases with every stressing event. This is not true for individuals with l-allele. They hardly change, if at all, even when repeatedly making painful experiences. The l-type shows (according to the criteria of the study) a trivial reaction to environmental influences (as the reaction is always the same), the s-type a non-trivial behaviour (as it changes with every new experience). This is not surprising. We all know that some individuals are sensitive and vulnerable and others are indifferent and indolent. It only would have been a surprise, if these different constitutions had no genomic differences. Now, the only conclusion allowed is that the 5-HTT gene is connected with emotional processing.

The study investigates one trait out of a complex pattern: the sensitivity for depression. It comes to the conclusion that (in a society with certain undefined values) a sensitive person is more inclined to become depressed when some defined values (job, money, spouse, health) are in question. This finding can be formulated

differently: A society with certain values brings forth depression in its sensitive members. It could well be imagined that sensitive persons in a different society or with a different study design, instead of getting depressed, will get religious. May be then 5-HTT would turn out to be the compassion gene. This is indicated by the fact that mildly depressed people are more compassionate than normal people (Queen's University 2005).

All these are rough hypotheses. But the expectation that a gene through its impact on metabolism brings forth a certain behaviour is a rough hypothesis as well.

However, there is a great danger when such trivializing definitions of behaviour become the starting point of therapeutic interventions. This is obvious in the case of psychotic experience, where the vicinity to creativity is a well-known fact (Jamison 1993) and the list of people who have been diagnosed as manic-depressive reads like a who's who of Western art (cited after Simon 1995: 192):

Hans Christian Andersen, Antonin Artaud, Honoré de Balzac, Charles Baudelaire, Irving Berlin, Hector Berlioz, Anton Bruckner, Lord Byron, Paul Celan, Joseph Conrad, Noel Coward, Charles Dickens, Emily Dickinson, Isak Dinesen, Ralph Waldo Emerson, T. S. Eliot, Edward Elgar, Georg Friedrich Händel, William Faulkner, F. Scott Fitzgerald, Paul Gauguin, Vincent von Gogh, Nikolai Gogol, Maxim Gorky, Ernest Hemingway, Hermann Hesse, Hölderlin, Victor Hugo, Henrik Ibsen, Henry James, William James, John Keats, Ernst Ludwig Kirchner, Heinrich von Kleist, Otto Klemperer, Wilhelm Lehmbruck, Malcolm Lowry, Gustav Mahler, Wladimir Mayakowski, Herman Melville, Michelangelo, Charly Mingus, Modest Mussorgsky, Edward Munch, Eugene O'Neill, Charly Parker, Boris Pasternak, Cesare Pavese, Sylvia Plath, Edgar Allan Poe, Jackson Pollock, Cole Porter, Ezra Pound, Alexander Puschkin, Bud Powell, Sergej Rachmaninoff, Gioacchino Rossini, Robert Schumann, Alexander Scriabin, Mary Shelley, Robert Louis Stevenson, August Strindberg, Torquato Tasso, Lord Tennyson, Dylan Thomas, Leo Tolstoi, Georg Trakl, Peter Tschaikowsky, Ivan Turgenjew, Walt Whitman, Tennessee Williams, Virginia Wolff, Emile Zola

Intervening in the basic organisation of the serotonin metabolism (what is current practice) or gene regulation (what most likely will be done) might lead to far reaching consequences on creativity, compassion and other central human values. These consequences cannot be proved or disproved as they do not show up under the conditions of study designs.

Quite similar is the case with autism. Who is missing on the list of the psychotics is represented in the list of persons said to have suffered from autism or Asperger's syndrome like Einstein, Freud, Yeats, Russell, Wittgenstein, Ramanujan or Turing (Fitzgerald 2004).

In an survey on the therapy of depression under the title “Future brightening for depression treatments”, the author comes to the conclusion: “While scientists continue to argue about the architecture of depression, however, enough has been discovered in recent years to give them a number of new levers to manipulate” (Holden 2003). Others see it more cautious: "It's almost unfortunate that the illness has the label 'depression',... It focuses our attention on the mood disorder and makes us forget the rest of the body, she says. Yet depression has as many consequences below the neck as above“ (Farley 2004).

As depression is an emergent state, every intervention on the basis of a linear understanding of the process cannot be something different than a manipulation. This habitude to manipulate has caused severe critics with strong statements such as “The Nuremberg code doesn't apply here”, comparing the treatment of psychiatric diseases with the medical experiments the Nazis did (Whitaker 2003). It is a matter of taste to go so far, but reading some examples of animal experiments in neuroscience, it is, in fact, difficult not to feel uneasy about the moral values, combined with dreams of unrestricted feasibility:

- In promiscuous male voles the introduction of a gene directly into the brain leads to high levels of vasopressin receptors in the ventral forebrain. This is associated with a lost of interest in other females. The male stayed with a previous partner just as a monogamous relative that has the same high density of vasopressin receptors (Linn et al 2004).

- Procrastinating primates can be turned into workaholics. It is sufficient to injected a short strand of DNA into monkey's brains, in order to temporarily switching off a key gene in a region of the brain called the rhinal cortex. With the gene turned off, the monkeys were unable to anticipate how many trials were left before a reward was given. As a result they worked hard throughout the task, making consistently fewer errors at every stage (Liu et al 2004a).

As a conclusion it can be said that the relation between the genome and behaviour is complex. Sometimes it is like a rigid trivial machine (one or several queens have to exist), sometimes like a trivial machine with one to multiple recursions (imprinting, acquisition of language), but very often like a non-trivial machine (nepotism in humans).

But, if one recursion takes place, the relation depends largely on our definitions (following the mother versus following a moving object). However, the idea of relation is not inherent in the observed data. It is a consequence of a theoretical

construction applied to the observed (as imprinting). There might be a strong relation but a loose correlation and vice versa.

The more recursive processes are genetically foreseen or the less trivial these processes are, the lower is the correlation genome – behaviour, although the relationship itself does not change. The process might be 100% determined, but the outcome cannot be predicted.

In a stable frame, recursive functions might seem trivial and a high correlation genome – behaviour might be thought of as a trivial relation.

It is always possible to analyse an organism from behaviour down to the genes. But it does not work the other way round if recursive processes are involved. This has been demonstrated for polycontextural structures where the classic principle ‘the way up is like the way down’ is no longer true (chap. 3.5). That is, genes are in principle undeterminable.

## **Appendix V**

### **A Schismogenetic Case**

A German woman in her end forties married to a Cretan and living in a Cretan village came to me with depression and sleeping disorders. She had been taking *Tavor* and other tranquillisers for many years. She also had seen some psychiatrists and the ambulance of the department of psychiatry at the University.

Her aim was to leave her husband, as he sat all day long in the *kafenion*, worked rarely and brought no money home. So they lived in poverty with their two children at the age of 15 and 17 becoming more and more problematic at school. She said that she would prefer to go back to Germany, but was afraid to find no job at her age. Also she did not want to tear the family apart. She asked me to help her to make a decision as she could not bare the situation anymore. What she told me about her husband was severe even for Cretan conditions. But I always refused to judge her husband. After some sessions I understood the schismogenetic process: The husband was not too fond of working, but if motivated he could work day and night. But he was very interested in sex. The wife wanted a good living condition but was not too fond of sex, but would participate, if motivated. As her husband did not bring in enough money she felt that she could not award his bad behaviour in having sex with him. But as he had no sex, he was not motivated to work. The result after some years was a quarrelling couple with no sex and no money and maladjusted children. Who was responsible? Blaming one side means to deepen the rift. In such a case every proposed solution might be a part of the problem and no solution at all. Helping her to leave her husband (as she demanded from me), would have driven her further into depression. In discussing with her all alternatives (going back to Germany, leaving the husband and living somewhere else in Crete), it actually turned out that those were no options for her at all. To solve the problem I proposed her to take money for having sex with her husband. It would be in the interests of both. May be this was a very male proposition and even shocked the women. But other solutions for her husband having sex, e. g., paying someone else or having a relation with the neighbour (he could not move too far as the car was broken and there was no money to repair it) made her even more furious. My proposition was an attempt to increase variety. She actually did not follow my advice. But she was not so strict with her complaints against her husband anymore. As there was no alternative place of living for her and she also did



not want to change her sexual behaviour, it showed that the situation was the best possible for her. In fact, she was relieved by this discovery. She stopped taking anti-depressive drugs, stopped drinking, and especially the children changed behaviour and had an excellent development nobody had expected before. From time to time she called me, just to hear from me that she lives the life she wants to live.

## Appendix VI

### Biological Hierarchies in CAM

Different methods of CAM have always used hierarchical models to judge how an environmental, inner or therapeutic stimulus influences the regulation of a person. By the help of such models these methods are able to estimate whether a therapeutic intervention leads to an improvement of the health situation or not. Furthermore, they enable the physicians to adjust the therapeutical means according to the observation. Although this is a normal procedure as every therapy is adjusted to the observed reaction (as in chronic headache, diabetes or psychosis), the hierarchical model allows a more detailed understanding of the courses of events. And often it is even possible to establish an individual long term prognosis. Most practitioners have such a theory, anyway. But it is mostly a private, an intuitive theory (chap. 6.12).

The best known example of such a model in medical history is the prognosis of Hippocrates (chap. 5.3.c). However, the Hippocratic texts do not reveal the exact procedure how the prognosis is established. Nor is it explained how the understanding of the pattern leads to certain therapeutic interventions. In contrast, different methods of CAM provide quite detailed models combined with the instructions when and how to intervene in the course of events.

This shall be exemplified with two models, one of acupuncture and the other, more detailed, of homeopathy. These examples shall demonstrate how complex observations can be organised, lead to an individual prognosis and instruct the therapist about a further procedure.

\*

The hierarchical model proposed by Chinese medicine and acupuncture is –according to the basic paradigm of Chinese medicine – precise and relational at the same time. The model says that the ‘cause of the diseases’ (mainly inner or outer stressors) (chap. 5.6.c) ‘penetrate’ the body in a certain order (König/Wancura 1979: 105). They ‘penetrate’ along the line

- skin – respiratory organs
- muscle – spleen
- tendons – liver
- bones – kidney

That is, a reaction to cold on the level of the skin and the respiratory organs reveals more stability than when muscles are involved. A rhinitis or a cough are thought of as not so deep rooted as when muscle pain, or even pain of the bones is present. The judgment of the 'depth of the disease' informs the therapist what kind of resources are necessary to encounter the unbalanced situation. This system is further refined by the involvement of the meridians which are also 'penetrated' in a certain sequence connecting the disturbance with the totality of inner regulation.

\*

The homeopathic model is more functional due to the strategic theoretical background. It is probably the most refined of all known models and has also been accepted by other methods helping them to assess the effect of their therapies. As this model concerns the observation of processes and does not involve the question which therapeutic stimulus is used, it might even provide helpful insights for the orthodox medicine.

The homeopathic model is called '*Hering's Rule*' attributed to the homeopath Constantine Hering (1800-1880) although it is not directly by him. It assumes that all kind of expressions of the body are somehow connected, even symptoms from organs without direct pathophysiological relation (headache with gastritis, depression with herpes, asthma with low back pain and so on). Comparable examples of orthodox medicine are syndromes, like Sjögren's disease or eczema and asthma in atopic disease. But orthodox medicine never considers a functional relation between these symptoms informing us about the inner condition of the patient. Exactly this does Hering's rule and by that it enables to assess the individual process of a therapy. It helps the therapist to understand when a therapy leads to an improvement of health and when not.

Hering's rule, exists in different forms. Basically it says that a therapy leads to a better condition when it shows the following characteristics:

- from interior to exterior,
- from chronic to acute,
- backwards in time,
- from top to bottom.

*From interior to exterior:*

This part of the rule refers to some basic assumptions about an inner hierarchy. A disease is said to be higher in hierarchy (more interior or inner) the more threatening

it is for the existence of the person. Lower in the hierarchy (more exterior or outer) is a disease when it does not really impose health problems. A simple skin process is not life threatening and therefore more exterior than asthma. The most inner processes are destructions (cancer, Alzheimer's disease), the dissolution of personal integrity (schizophrenia, psychosis) and the general decline of strength.

The first part of Hering's Rule says that a therapy goes well when symptoms on a higher hierarchical level vanish and symptoms on a lower hierarchical level appear. Then the disease goes from interior to exterior. This happens, for example, when asthma goes away and eczema appears, or when a depression goes away and gastritis arise, or when a general weakness (a fatigue syndrome, for example) improves but myoskeletal problems appear or intensify. All this is regarded as an improvement of the general health situation and does mostly not induce a change of the therapeutic strategy.

The opposite, suppression, occurs when symptoms on a lower hierarchical level vanish and symptoms on a higher hierarchical level appear. For example when a gastritis improves but the patient becomes more depressed, or when an eczema improves but asthmatic symptoms occur or increase. Then an immediate change of the therapeutic strategy is necessary.

Although this sounds strange for the reductionist trained scientist, the examples of suppression cited before (chap. 6.8) follow exactly this pattern. An example is the therapy of gastritis with acid-suppressives which leading to an increased risk of community-acquired pneumonia (Laheij et al 2004). This is, according to Hering's Rule, a classical development from exterior to interior, as pneumonia is more life threatening than gastritis. On the other side, a patient with recurring pneumonia, re-establishing a healthy pH, will for some time suffer again of gastritis until he overcomes also this stage and achieves a better equilibrium. The reappearance of gastric disease indicates in this case the termination of pneumonias (from interior to exterior). However, rarely it is possible to find such a related pathophysiological mechanism between the symptoms of different 'levels'.

The connection between the levels has not to be immediate. There might even exist a long period of time with no symptoms at all. A patient given a acid-suppressive therapy will not immediately develop pneumonia, if at all. And a patient with recurrent pneumonias discontinuing acid-suppressive therapy will not produce a relapse of his gastritis immediately. It might even be missing.

Especially in atopic disease no symptoms might be seen for decades. Eczematic dermatitis occurs mostly in early childhood for several months or years and asthma might arise at the age of 20 or even later. This connection is still regarded as ‘from exterior to interior’.

According to Hering’s rule suppression would be characterized by the line eczema – allergic rhinitis – asthma – deeper rooted diseases as depression, psychosis (chap. 2.3.h) or ADHD (Simchen 2004). This line must not include all steps. Eczema and depression might follow each other immediately demonstrating a low ability to maintain an equilibrium. An effective therapy would follow the opposite line. When depression becomes better and asthma or eczema arises it is seen as favourable and the process should be supported or, at least, not disturbed. In such a case a homeopathic therapist might leave the eczema untreated for weeks and months, as long as the more inner symptoms (depression or asthma) improve. In treating the skin symptoms he would see the danger of creating a new suppression with a negative impact onto the health of the patient.

Such a view makes no sense for the orthodox physician. But it might be worthwhile to investigate such empirical models, especially as scientific medicine has no theory at all about the interconnectedness of inner processes.

#### *From chronic to acute:*

This part of the rule says that when a chronic disease becomes better acute diseases will prevail for a while. This observation of empirical medicine is supported by the current physiological knowledge.

Chronic disease is characterized by a lack of typical body rhythms (Hildebrandt et al 1998: 33). The activation of inner rhythms is accompanied by crises (chap. 5.3.b). These crises can be the initial deterioration (chap. 6.11) of the usual symptom. It might be, as well, a problem unconnected to the initial disease. A typical case in balneology is an abscession of a tooth becoming symptomatic. Of course, this abscession has existed before but through the general activation the inflammatory focus becomes symptomatic.

Furthermore, a lot of chronic diseases are characterized by a type 2 situation (chap. 6.3) with a reduced ability to fight acute bacterial and viral diseases. That is, a lot of pathogen germs are present in the flora but are not attacked. When the relation between Th1 and Th2 cells improves, immune response will improve as well. As a

consequence the organism will combat these germs leading to a series of acute infections. Every new infection and every new elimination will change the composition of bacterial and viral flora (Nowak/Sigmund 2004), something that might lead to further acute reactions until a new adaptation is attained. That is, an immune system finding a new balance from a pre-existent type 2 imbalance will mostly lead to acute infections. Empirical observations suggest that this development starts normally several months after the beginning of a therapy. This coincides with the finding of chronomedicine that the reoccurrence and stabilisation of rhythms is a process of months (Hildebrandt 1986: 203-204).

In the social setting of the family it can be assumed that when a deadlock resolves and more resources are available, problems are tackled and solved which had remained untouched for years.

#### *Backwards in time:*

This is an often made observation. In the first days or weeks of a therapy old symptoms that have been forgotten reappear. Old wounds might itch, a trauma that happened years before hurts again, an old lumbago becomes symptomatic, etc. This might occur within days and each symptom remains for minutes, hours or days. This process might also be protracted, with the symptoms be present for weeks.

There are different explanations. Based on the hierarchical model from exterior to interior one might assume a reversal of a former suppression. A more pathophysiological explanation would be that there are apoptotic processes (chap. 5.3.a) all over the body that never had been terminated completely maintaining minor inflammations. Such remaining subclinical processes might be the consequence of the immunological imbalance of chronic disease. In finding a better balance the immune system becomes capable to terminate these processes.

#### *From top to bottom:*

The observation that a process leads to a better equilibrium when symptoms from the upper part of the body disappear and symptoms in a lower part of the body appear (or from proximal to distal) is not supported by any cybernetic or physiological model. Up to my knowledge there is also no correlated concept in family therapy, either. Interestingly Hippocratic medicine and homeopathy maintain such a relation.

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## Abbreviations

It was tried to avoid abbreviations as good as possible.

ADHD	<i>Attention Deficit Hyperactivity Disorder</i>
BMD	<i>bone mineral density</i>
BMJ	<i>British Medical Journal</i>
CAM	<i>complementary and alternative medicine</i>
GST	<i>general systems theory</i>
DSM	<i>Diagnostic and Statistical Manual of Mental Disorders</i>
HRT	<i>Hormone replacement therapy</i>
ICD	<i>International Classification of Diseases</i>
N Engl J Med	<i>New England Journal of Medicine</i>
NHS	<i>national health service</i>
NSAID	<i>non-steroidal anti-inflammatory drugs</i>
PNAS	<i>Proceedings of the National Academy of Science of the United States</i>
RA	<i>Rheumatoid Arthritis</i>
RCT	<i>randomized clinical trials</i>
SBC	<i>Spencer Brown Calculus</i>
SCN	<i>hypothalamic suprachiasmatic nucleus</i>
SD	<i>standard deviation</i>
TCM	<i>Traditional Chinese Medicine</i>
Verum	<i>opposite of a placebo, a drug containing an effective substance</i>
VTA	<i>ventral tegmentum</i>
WHI	<i>Women's Health Initiative, a large study on hormone replacement therapy</i>

## Biographical Note

Georg Ivanovas,

born 1953, Russian-German origin,

grown up in Germany,

study of medicine in Munich and Bonn 1972-79,

internship in surgery, obstetrics and rheumatology,

own medical practice since 1989, at first in Bad Wurzach, Germany, since  
1993 in Heraklion, Crete

Further training in naturopathic treatment, balneology, homeopathy and  
different methods of psychotherapy (Gestalt, body-therapy, systemic  
psychotherapy)

Publications about systems thinking in medicine since 2000