

Coherence regulation and motivation

The human being: an information-processing creature

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People act and co-operate purposefully - even unconsciously. Wounds and illnesses heal in the direction of health. This is how salutogenesis happens. Living information processing has a direction. How can we understand this scientifically and what connections play a role in therapeutic practice and our good life in general?

A principle of attraction and co-creativity

Chaos research and, more recently, complexity research have found mathematical and scientific explanatory models for the attractiveness of desired states of order such as patterns in chaotic dynamics, which also include health and well-being. They describe the fact that complex dynamic processes are attracted by attractors. These attractors are completely abstract pieces of information. Analogous to these attractors in chaos and complexity research, I call attractive goals of complex dynamic processes, as far as they affect (human) life, such as well-being and health, *attractiva*.¹

¹ After several years of endeavour (including together with the physicist Bernhard Wieneke, who holds several international patents in the field of flow measurement technology), I have given up the claim of calculability in connection with human life. The reasons for this lie, on the one hand, in its complexity and its fundamental unpredictability when longer periods of time are involved and, on the other hand, because the attention and fixation on mathematical formulae means an orientation of attention in a direction that is not conducive to healthy development - at least for me as well as others. Furthermore, the etymological meaning of the ending "-tor", namely "masculine and active" (as in tractor and terminator, for example), does not match the nature of attractive information that attracts the dynamics of a (possibly seemingly chaotic) process. Rather, an attractive beauty that is attributed more to the female sex (see also Yin and Yang) fits in with this.

Reflecting this phenomenon, we can understand attractiva and attractors as spiritual aspects that are attractive for energies as well as for living dynamics. Energy follows attention; attention follows an intention and/or a thought.

In order to establish a living dynamic order, living organisms need a living information processing system that harmonises the information of the organism with that of the environment and processes it in accordance with the attractiva (coherence, target states). If we look at growth, healing and development processes (including evolutionary processes), we can recognise an attraction principle. Dynamics approach an attractiva, sometimes in seemingly chaotic ways (see also *convergence* in evolution).

If we reflect on the interactive relationship between the individual and their multidimensional environment, we can assume that there are variable and long-term coordinated attractiva. There are apparently states of order of varying duration. Generally understood, the attractiva can refer to both short-term, e.g. daily, and life phases, e.g. a whole life, a family, a company, a nation etc., a biological species or genus as well as the whole of evolution. The principle for approaching this order remains similar in all time dimensions: For a living being, coherence with its multidimensional environment and within itself is attractive for living life. As a superordinate attractiva, this coherence inside and outside is decisive for the deepest and highest aspirations of human beings and thus also for their strongest long-term motivation. This includes all forms of healing.

As a human being, I look for co-creative cooperation² in order to approach our attractiva together with other people and nature.

What is motivation? How does it arise and what does it do ?

Living beings have their own activity directed by motivation, which regulates them in their relationship to the environment and thereby helps to shape the environment. The question of motivation is the question of what drives people to activity such as movement, i.e. what causes them to do or refrain from doing something.

The question of motivation focusses on the living individual, which absorbs substances from the environment with its metabolism, processes them in as constructive a way as possible and excretes them again. These are not only substances, but also information that is only partially bound to substances, such as radiation and fields. Information can be found in form, quality and patterns. Living individuals are information-processing systems. This aspect is particularly important when we consider the question of motivation. Motivation is a result of the lively processing of information - ultimately probably under the aspect of coherence. The question of motivation in relation to metabolic activities touches on the basis of all living things. Since metabolism is a basic characteristic of living beings, the question of motivation extends to the question: *What motivates living beings to live?*

Motivation follows from evaluation - and influences evaluation

Using the example of metabolism, we can visualise the basic motivations of living beings: 1. coherence mode: to rest in trust and coherence, 2. appetite mode: to approach and assimilate what is constructive with pleasure, and 3. aversion mode: to avert threats and establish security. An individual must be able to evaluate the information from their environment as to whether it is more likely to be co-operative, enticingly constructive or

² See the basic research on cooperation by Tomasello (2010, 2011 and Tomasello & Hamann 2012).

threatening. The subjective evaluation in each of these three categories leads to differently orientated activities such as movement directions and patterns. Thus we can already speak of three basic motivations in unicellular organisms: 1. to rest, so that resonance with the supersystem can be established, and to reproduce, 2. to approach and ingest food and 3. to avert danger. These motivations are each the result of perception and evaluation, i.e. the subjective information processing of the individual (see "Evaluation theory" in Lazarus (Beckmann & Heckhausen 2018)).

At the deepest level of life, metabolism is prompted by the *striving for autonomy in harmony with the environment*. This appears to be the overriding desired state. Differentiated motivation arises in the area of tension between autonomy and harmonious connection with the outside world: the motivation to breathe, to eat, to cuddle, to work, to seek help, etc. Different physical activities occur in each case.

This systemic view, which sees motivation as arising from the relationships between the individual and their environment, enables a holistic and organising approach to various theories and models of motivational psychology, such as self-determination theory, the "three great motives" according to McClelland, the "3-C model" and others. (McClelland 1995 cited in Kehr et al. 2018, p. 605; "3-C model" in Kehr et al. 2018).

Both health and illness arise in the relationship between autonomous living beings and the environment, as described by more recent health theories (Ottawa Charter 1986; Antonovsky 1979, 1997; Mittelmark et al 2022; epigenesis see Bauer 2021; Petzold 2000; 2021, 2022a, b; Göpel 2010; Geneva Declaration of the World Medical Association 2017; and many others). In its 2017 Geneva Declaration, the World Medical Association declared³ autonomy and health as primary values in the doctor-patient relationship. These should guide doctors' motivation to cooperate with patients.

Motivation through "carrots and sticks"

Many people first think of motivation as something pleasant, perhaps even inspiring, a "positive" motivation that can be triggered by a promise of reward, a "carrot". The other well-known motivation is the drive to avert threats, to fight or flee or to play dead in order to avoid "the stick" or other threats. These two motivations (to approach and to avert/avoid) are linked to basic emotions (Grawe 2004; Elliot 2008; Petzold 2022a).

So far, motivational psychologists have usually either assumed two basic motivations that ultimately react to "carrots and sticks" (Grawe 2004; Elliot 2008; Schultheiss & Wirth 2018; Rheinberg & Vollmeyer 2019, p. 17 and others) or they describe a number of different motivations without conclusively classifying them (Heckhausen H. 2018; Schultheiss & Wirth 2018; Rheinberg & Vollmeyer 2019; Spitzer 2007, 2021; Brohm-Badry 2021). Tobias Esch was probably the only person apart from me to describe three types of motivation. As a third basal motivation to the appetite and aversion motivations, he describes the "motivation type C", which is linked to happiness and serenity (Esch 2017, 2022), which I call the coherence mode.

Doctors, health services and health insurance companies as well as managers and educators often follow the motive of motivating their patients or members or employees or

³ "My patient's health and well-being will be my top priority.
I will respect the autonomy and dignity of my patient. I will maintain the highest respect for human life."

children. In their minds, too, people are often only motivated by rewards for desired behaviour (e.g. praise, freedom from pain, pleasure, reduced contributions, bonuses for successes, money for good grades, pizza or money for vaccination against Covid) and punishment for undesired behaviour (e.g. so called fear appeals such as increased suffering, worsening of symptoms, warnings for inappropriate behaviour, detention for poor performance, fines, professional bans, etc. for refusal to be vaccinated). "*Carrots and sticks*" are well-known measures for motivation and conservative education, i.e. deliberately intended measures to induce people to behave in a certain way. In animal experiments on motivation, the focus is almost exclusively on reward and punishment. These are the two major *incentive classes* that we find almost everywhere - sometimes in the foreground, sometimes more in the background.

Motivations based on ethical or other meaningful goals are difficult to test in animal experiments. This may be one of the reasons why these motivations have hardly been researched by scientifically orientated psychology and are rarely mentioned in textbooks. Only recent methods of brain research, such as positron emission tomography (PET), have made it possible to visualise physiological changes in the brain in subjective ideas.

With the question of motivation, the human being is placed at the centre of consideration and reflection as a *responsible (co-)decisive* agent in the Anthropocene.

Basic motivations ⁴

If, as a human being, I am born with an ideal image of coherence, then it is a general and great challenge and life task for me to help shape the reality I experience after birth in the direction of my ideal image. The coherent ideal image thus forms the overriding standard for my curiosity, my searching, *perceiving* and *evaluating*. I experience all deviations from this ideal image as *incoherences*. These incoherences motivate me to do something more to *get closer to the ideal image* - as soon as I see it as *meaningful* and *possible*. Under this assumption, I want to understand the development of people. My first step in this life process is to *perceive and evaluate* reality - measured against the inner ideal image of coherence inside and out, the attractiva. This is followed by activities to bring reality closer to ideality.

If my organism is in sufficient harmony with my environment, I can be in resonance with it and resonate in a complex way. This is an overriding goal of the basic coherence motivation. This coherent resonance is decisive for the underlying coherence mode - the attitude that my coherence motivation strives for.

From this basic serenity mode, I am prompted to engage in a directed activity when a) my organism needs something, has a pleasurable appetite goal such as *satiety*; for example, if I am hungry, my appetite motivation is activated, or b) if I perceive a threat, an object of aversion, my aversion motivation is activated. The goal of aversion is safety, security.

In addition to coherence motivation, these are the two other basic motivations and basal activity modes that living organisms exhibit from unicellular organisms onwards and that form very complex neuro-endocrine motivational systems in humans.

⁴ Motivation here means an inducement for activity, for the activity of an entire person, a collective as well as a cell or a genome or brain activity. Every activity of a living being needs a motivation.

Three neuro-endocrine motivational systems and attitudes

Appetence-/ mode (pleasure mode) "Inner reward system", nucl. accumbens, "wanting"	Approach	Coherence mode (superordinate - serenity/ calmness) PFC, "Liking", Vagus	Aversion-/ Avoidance mode (stress mode) Amygdala, Sympathetic nervous system
• Desire • Courage • (Self-)favour • pleasure • sensuality • - Problem solving		• Coherently connected • Joy • Loving • Calm • Primal/trust • Autonomy • Well-being • Sense of belonging • Fair, just • Finding meaning • Integrating	• Unpleasant, incoherent • Anxiety, fear • Disgust • Victim role, powerlessness • Pain • Injustice • Injury • Having problems

Fig.1 This table lists the three basic motivations for healthy development with important characteristics.

These three basic motivations with basal neuro-endocrine systems characterise our relationships with the environment and trigger three different categories of activity in the organism, from genes to thinking and speech. Their respective activity is the result of the preceding processing of incoming information. This information processing takes place in accordance with attractiva. These motivational systems ensure that the evaluative perception is converted into activity. If, for example, the result of a child's information processing at an early stage of development was that it did not get enough to eat and/or love from its mother, it may develop compensatory unhealthy eating behaviour or even addictive behaviour. This subjective experience can later lead to a permanent desire to compensate for this perceived lack. If threats and insecurity are experienced early on in the relationship, a compensatory striving for control can develop. This can cause people to lose real joy in life and emotionally enclose themselves in thick walls or wage war if they believe they are in a permanent struggle for survival .⁵

Motivational conflicts, including ambivalence conflicts, can arise between the different motivations, which can lead to an inhibition of movement; e.g. a man wants to approach a woman, but is afraid of rejection. For our healthy development, we need all three basic motivations, whereby a good, integrating and *constructive interplay* arises through the guidance of coherence motivation - the striving for inner and outer coherence - often unconsciously, sometimes consciously. The overarching long-term goal is a good life for everyone in the biosphere - coherence inside and out.

Multidimensional coherence regulation

In the co-operative interaction between the individual and the environment, each living system regulates itself as a permeably limited system striving for coherence.

⁵ This endeavour can also give rise to constant efforts to build resilience.

Living beings are information-processing systems from the outset. They receive information from their environment (= perceive, resonate with their environment and other information), evaluate this information according to internal standards of coherence, their sense of coherence (is it tempting, threatening or coherently co-operative?) and decide (often unconsciously) in which direction they themselves move (= motivation) depending on its significance.

Antonovsky (1997) describes the "sense of coherence" (SOC) as consisting of three components: *significance (meaningfulness)*, *manageability* and *comprehensibility*. These can be found here in similar terms in the dynamic model of coherence regulation: perceiving what is meaningful - acting - reflecting/understanding/learning (Petzold 2011, 2012b, 2013b, 2021a, 2022a,b). For Antonovsky, the component of meaningfulness is the most important motivational component (1997, p. 38). For Antonovsky, the three components relate to the body (manageability), emotions (meaningfulness) and cognition (comprehensibility). Here we find correspondences to the ego dimensions outlined below.

A self-regulation model can be derived from the above, which has coherent cooperation with and in the multidimensional environment as its overarching goal. We understand self-regulation as a *cyclical regulation of coherence* in three distinct, feedback and recurring phases. The first phase of coherence regulation is *the perception* of a deviation of the actual dynamics from the implicit attractiva - the ideal of coherence. In our real interactions, we perceive deviations of the actual cooperation from the target cooperation.

To simplify matters, we can use cybernetic terms to talk about actual states and target states, bearing in mind that the target states can have a certain degree of flexibility and indeterminacy. Beckmann & Heckhausen (2018, p. 105) describe a similar control mechanism in their discrepancy theory. If an incoherence is assessed as significant by an individual's sense of coherence, they are motivated to become more active in order to achieve greater coherence again. Depending on the assessment of the current state and the dynamics, one of the three basic motivations is triggered and the corresponding direction of movement is initiated or intensified. People interact with their environment in a focussed way.

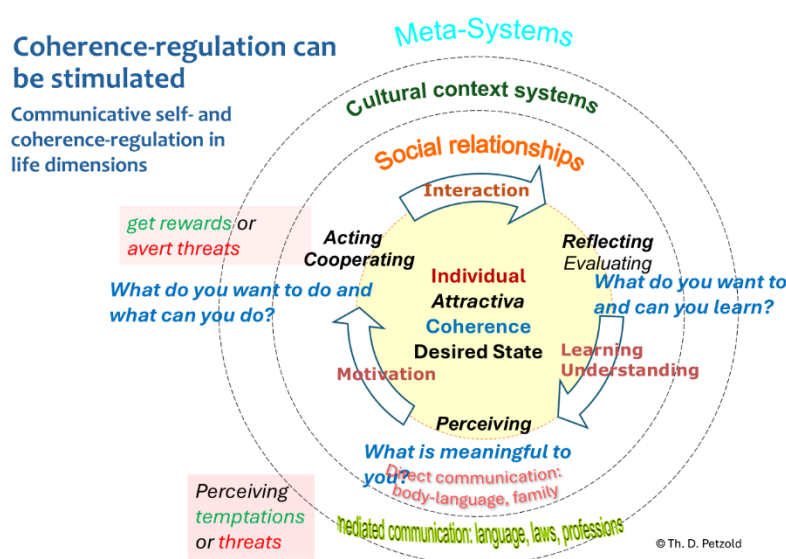


Figure1 : Coherence regulation in a multi-dimensional environment: The coherence regulation described here does not take place in isolation, but in interrelationships in a multidimensional environment. For each dimension of life, humans have developed corresponding modes of communication and co-operation in their ego dimensions. (From: Petzold & Henke 2023)

After the activity has been completed, in the final phase, the reflection and learning phase ("final phase" in Schultheiss & Wirth 2018), the experiences and the result (= information) of the interaction

are processed and evaluated (balanced) and integrated into the organism for the next cycles (cf. "extension memory" in Kuhl 2018, pp. 411, 414). The main differences between this self-regulation model and others (Vohs & Baumeister 2011; Glattacker & Heyduck 2016; Baumann & Kuhl 2022) are, in addition to its *multidimensionality*, 1. that *coherence* as a complex target state of interaction (as an attractiva) is at the centre and 2. Each cycle begins *anew with perception*, which is orientated towards the current target states. Several cycles, even of different lengths, can run in parallel and information from previous cycles can be integrated in a feedback loop.

In contrast to this perception phase, which can create a new motivation in each case, the reflection phase takes stock of the target state of the previous motivation that prompted the reflected interaction. The motive of the previous interaction may still be present or a different one may take effect. For example, after eating, the organism reflects on whether it is full, feels invigorated, is tired or whether something about the food was not good. This reflection relates to the food motive that prompted the eating and possibly also to the sense of coherence. In a meta-reflection in coherence mode, the motive for eating can also be reflected upon: Why did I eat? Was I really hungry? Or was I just craving a reward, a treat? Once this interaction and reflection is complete, it is possible to perceive what is important now in a completely new way. This can lead to a change from the current action-relevant motivation in pleasure mode to coherence mode, e.g. after a meal you can decide between resting, going for a walk, working or doing something else.

Starting with single-celled organisms, living beings already display the three categories of activities mentioned above and the associated motivations: Resting and co-operating in serenity (basic metabolism, growth, cell division), approaching and taking up food and averting threats. As already described above, these three directions of movement are characteristic of all living beings in their environmental relationships: 1. pausing and connecting internally in resonance with the coherence of supersystems, 2. turning towards, approaching and absorbing, and 3. turning away, fighting or freezing. These three basic modes of motivation can therefore be understood as the result of information processing in the interaction between living beings and their environment. *The basic search* of living beings (including motivation to perceive) is for *coherent co-operation* that is *conducive to life*. This is the basic assumption and starting point for organismic self-regulation.

This results in three phases of coherence regulation and three basic abilities of living beings, which are linked to their three basal motivations, i.e. their cause for the respective activity:

1. Ability to perceive/discern
2. Ability to act/cooperate
 - a. For connected cooperation in trust and coherence
 - b. For searching, finding and picking up what is building up
 - c. To avert danger
3. Ability to reflect/learn and integrate

On the one hand, motivation is the result of information processing. On the other hand, it co-regulates attention and the selection and evaluation of information⁶. When I am hungry, more things seem tempting to me than when I am full. Even our perception is intentionally controlled.

6 cf. the function of the LPFC in Schultheiss & Wirth 2018, p. 312; Freeman after Schiepek 2004.

Ego dimensions and life dimensions

Life and ego dimensions are formed phylogenetically

In the course of evolutionary cocreation into ever more complex life forms, some major stages of development can be recognised in all the diversity of living beings, which, as specific organisational structures, each represent phylogenetic results of the information processing of living beings in their respective environment. As each further development builds on the previous structure and integrates or adapts it as far as possible, we still find structures and functions in humans that can be found in other mammals, reptiles and even single-celled organisms. For example, brain researchers refer to a human brainstem region as a "reptilian brain". But even a single-celled organism is an information-processing system. Serotonin and tyrosine have also been found in the cells as the starting molecules for dopamine and adrenaline, which are known to us as important messenger substances in our brain. Recent experiments with the single celled slime mould *Physarum polycephalum* show that it can even pass on information about a threatening experienced stimulus to other slime moulds when it is united with it (Beste 2021).

Tobias Esch's research also shows that people have an intrinsic motivation to belong (2017, 2022). This appears to be an aspect of coherence motivation and relates to every dimension of life. It is experienced and described as cooperation, fitting in and integration, among other things.

Are there structures and processes in humans for this adaptation of living beings to their environment, known as co-operation and assumed by biologists, sociologists and psychologists, which implement this integration and adaptation? These structures could have formed epigenetically in co-creative interaction according to the principle of attraction.⁷ If so, which ones? And how do they work? ⁸

Porges (2010) has already shown an example of the integration of reptilian self-regulation (posterior vagus branch) into human self-regulation. This energy-saving self-regulation probably forms part of the physical coherence regulation of our organism in the brain stem and the lower limbic level ("1st personality level" according to Roth 2019, p. 89 f). As these structures and functions were essentially developed in early evolutionary stages in co-operative interactions with the respective physical biotope and in ontogenesis during pregnancy and in the first months of life, the 1st dimension of life, we call this regulatory level the *1st ego dimension (ID)*. In this 1st ID, our organism regulates its physical target states and needs in its environment.

A newborn has to adapt its metabolism to its new environment. The heat balance, oxygen and acid-base regulation and other activities are newly regulated. The regulatory centres

⁷ It is possible that the finding that the so-called language centre (Broca's area and Wernicke's centre) already exists in chimpanzees, which do not have a differentiated language at all, is an indication of the understanding of evolution advocated here: then human development can hardly be the result of a survival advantage through speech, but rather the corresponding brain development and then language development must first be understood as the result of resonance in the interaction with a more complex coherence of the environment.

⁸ Porges (2010) has already sought and provided answers to this question in his polyvagal theory, whereby he saw a "*system of social engagement (SSE)*" in the anterior vagus branch.

for this autonomous physical coherence regulation form the 1st ego dimension in accordance with this.

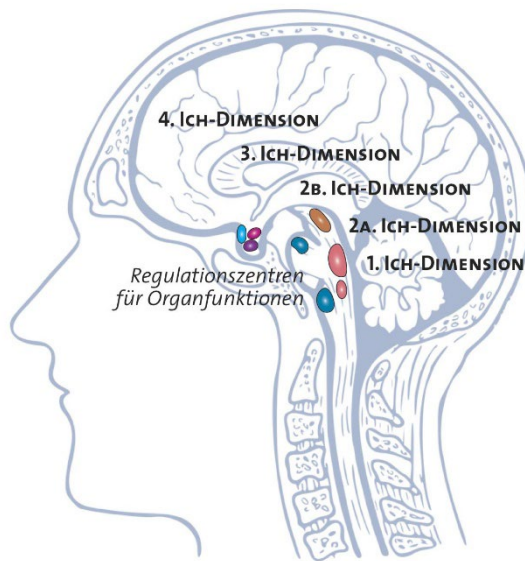


Figure2 : Approximate location of the representations of ego dimensions in brain structures (From: Petzold & Henke 2023)

A child has a range of needs that it can only satisfy in relation to its caregivers. This results in successes and frustrations that trigger emotions and affects: emotional interaction patterns. In these direct social relationships, the 2nd ego dimension is formed, in which social interaction patterns are stored ("*instinctive behaviour*"; according to Roth 2019) in the middle and upper limbic level). Panksepp distinguishes

neurophysiologically seven motivational affect patterns (Schultheiss & Wirth 2018, p. 315), which can be linked to so-called basic emotions. We can differentiate between these: In the middle limbic level, people regulate existential needs in direct interpersonal (= social) cooperation with their caregivers, usually parents and siblings. The moulding of this basic social relationship level should be largely completed by around the age of 4. With the regulation of primary needs in social co-operation, the first stage 2A. of the second, social ego dimension is formed. This is followed by the imitation, learning and testing of more complex social roles, such as mother, father, child, victim, rescuer, avenger, judge and so on. The patterns of these roles are regulated in the upper limbic level, which appears as 2B. of the social ego dimension⁹. We see the motivation for this learning as a coherence motivation for belonging and participation in co-operation in direct interpersonal relationships - in co-operation for the transmission and development of life in the family and community.

A person can make a mental decision to behave in a certain way (see volition). The reason for this can be a co-operative agreement with other people, such as arriving at work on time. Then the person's actions and often also their feelings follow their conscious will (see also "motivational self-image" in Rheinberg & Engeser 2018, p. 446 ff). The metabolism may adjust itself to the desired behaviour. Humans live in language (Maturana 1996). A suitable 3rd ego dimension (represented particularly in the neocortex; Roth 2019) is formed for this cultural cooperation. Here, more abstract information is processed in a more differentiated way and more complex forms of cooperation are organised. More people can be involved via mediated abstract communication than in direct sensory communication.

There is probably a 4th ID, which regulates global and mental coherence in the prefrontal cortex (and/or other regions) in the youngest part of the brain, whose individual imprint goes

⁹ For Roth, these correspond to the 2nd and 3rd personality levels and the 3rd ID here corresponds to the 4th personality level.

beyond puberty. We can only speculate about a 5th ID in resonance with a cosmic dimension of life.

Each of these ego dimensions has been pre-structured in the brain in the course of evolution and is ontogenetically characterised by experiences at certain ages. The three basic motivations form the basis for these imprints. The strength of a motivational system can vary for genetic reasons (Grawe 2004, p. 272; Schultheiss & Wirth 2018; Panksepp & Moska 2008). However, relationship experiences, especially early childhood experiences, are generally more important for individual and cultural characterisation than genetic predisposition.

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