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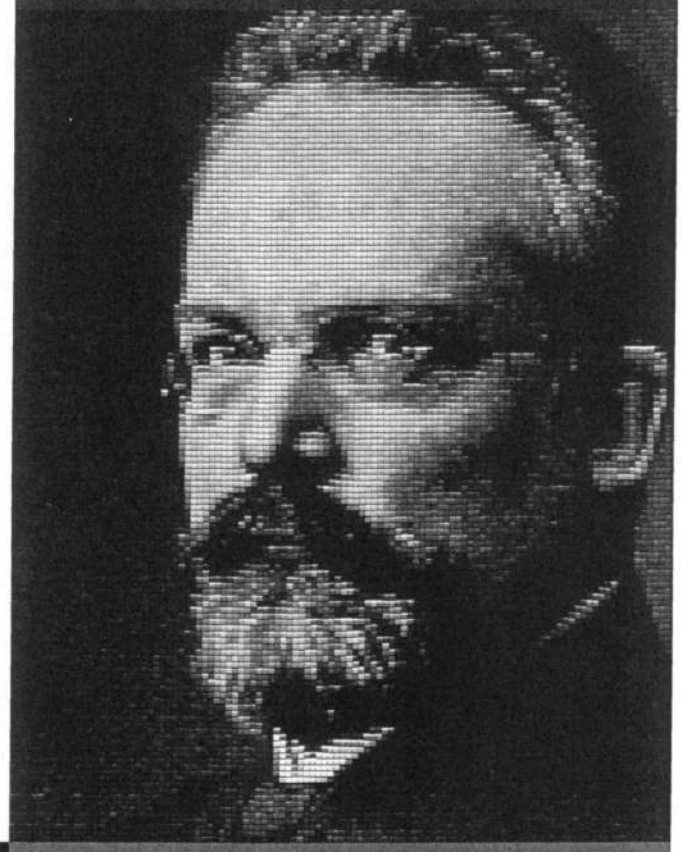
Complex Cognition and Qualitative Science:

A Legacy of Oswald Külpe



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OSWALD KÜLPE AND THE WURZBURG SCHOOL FROM THE PERSPECTIVE OF MODERN SYSTEMS THEORY

Jürgen **Kriz**
University of Osnabrück
Germany

1. Introduction

Given the amazingly large number of famous pupils, Oswald Külpe has to be regarded as one of the most influential thinkers in psychology in the late 19th and early 20th centuries. Max Wertheimer and Kurt Koffka (the founders of the famous Berlin school of Gestalt Psychology), Albert Michotte, Narziß Ach, Otto Selz, Karl Bühler (each of whom also had a large number of famous pupils - among them Paul Lazarsfeld, Konrad Lorenz, Egon Brunswik, Sir Karl R. Popper and Edward Tolman) and the philosopher Ernst Bloch all have their intellectual roots in the "Würzburg School" of Oswald Külpe.

Indeed, during this time the Würzburg School was the core of a much different approach to psychology- and without exaggeration, a different understanding of "the world" as well. As Hoffmann, Stock & Deutsch (1994) point out, psychology in Germany at the end of the 19th century and at the beginning of the 20th century was characterised by the association theory and by enthusiasm for the applicability of scientific methods to psychic phenomena. It was assumed that the laws of mental life can be completely reduced to associative relations between elementary units. The application of the experimental method to psychic phenomena was encouraged by the success of psychophysics as well as by the successful application of the reaction time method. These methods, however, confined the investigation of psychic phenomena to simple psychical objects and processes. Wundt didn't claim that higher psychic processes were of no interest or that they were not a subject for scientific research. But he did claim that the investigation of higher psychic processes has to be restricted to the comparative methods of ethnic psychology - which gives such studies a totally different (not to say: inferior) meaning and value in the discourse of sciences.

Although (or, maybe, because!) Külpe was an assistant of Wundt at Leipzig for 8 years (1886-1894), he doubted the necessity of these reductive methods in carrying out a genuinely scientific study of all psychic phenomena. In contrast to the dominant tendencies of the time, at the Würzburg School Külpe and his followers applied the experimental approach to the inverstigation of higher

mental processes as well. Külpe stressed over and over that psychic processes have to be treated as a whole - and that therefore it would be inadequate in many cases just to look at parts of this process and to attempt to understand the whole process by simply adding up the functioning of these parts. In contrast to the synthetic approach of putting parts together, Külpe viewed psychology the other way round: the dynamic of the parts themselves is influenced by more general or holistic cognitive activity which influences the direction of the thought processes and determines their course. In their historical report on the Würzburg School Hoffmann, Stock & Deutsch (1994) point out: "To explain the directed aspects of thinking they (the researches of the Würzburg School, J.K.) introduced completely new concepts such as the state of consciousness (Marbe), the thoughts (Bühler), the determining tendencies (Ach) or the schematic anticipation (Selz), which, according to their observations, could not be explained by elementary images, and they used the experiment for the analysis of more complex mental processes as well" (p. 27).

As forerunners of the Berlin School of Gestalt Psychology (Wertheimer, Koffka, Kohler, Goldstein), Külpe and his colleagues in Würzburg were not so much interested in factors which act in isolation, but rather in the whole interrelated dynamic of processes (the "Gestalt") within which the factors or parts act together in a coherent manner. Moreover, by introducing the concept of "anticipatory schemata" they re-established teleological thinking (see below) in the form of "an anticipation of the final state, [where] this anticipation becomes schematic even when the partial conditions for reaching the goal are still unknown (Selz 1927 after Mandler & Mandler 1964).

Approximately one century later, the basic elements of this controversy between Külpe and his Würzburg School (along with the Gestalt Psychologists) on the one side, and Wundt and the followers of the association theory on the other, are still present as the background for similar controversies in a more modern and in some cases modified manner. For example, in psychology (and in science and societal metaphors which have developed from classical science and try to get their justification from that science) we find still today the controversy between a more holistic dynamic and a more synthetic approach: In the holistic dynamic approach the dynamics of lower-level parts is taken to be influenced top-down by the whole system. In contrast, in the synthetic approach, a detailed analysis of small parts is focused upon, motivated by the bottom-up assumption that such basic parts can be arbitrarily added and synthesized into a whole (and often: a "new" and "better" one than before). However, in contemporary science it is (or should be) clear to every serious researcher and practitioner, that top-down and bottom-up perspectives belong together, each one focusing on and explaining special aspects of the complex dynamic processes which are typical in a more realistic understanding of most phenomena.

In order to understand and to appreciate Külpe's contribution to the development of a science which is more holistic and adequate, especially to studying the complexity of life and its processes, we will discuss in this chapter the differences between the classical approach and a perspective, typical of the Wurzburg (and later the Gestalt) School, which is nowadays typical for the system-approach often advocated in interdisciplinary discourse. From this perspective, Külpe can be seen as a precursor to a special approach to "encounter with the world", one which is very up-to-date with regard to interdisciplinary systems research.

2. Core Concepts of Systems Theory

2.1 Interrelatedness and Feed-back

A core distinction between classical mechanistic and modern systemic approaches is illustrated in Figures la and lb: In Figure la, an input "I" is given to the box, which *operates* somehow to give an output "O." This is not only the underlying perspective of stimulus-response psychology and the core of experimental science. It is also, at least quite often, the everyday understanding disseminated in textbooks describing social relationships. A wife asks her husband: "what do you mean by X?" And he gives an answer. The question is identified with "I" and the answer with "O," and the interaction takes place because the wife cannot look directly into the "black box" (the man's mind) but has to investigate this box by input-output analysis. Typically, this is the classical metaphor of experimental input-output analysis applied to human relationships.

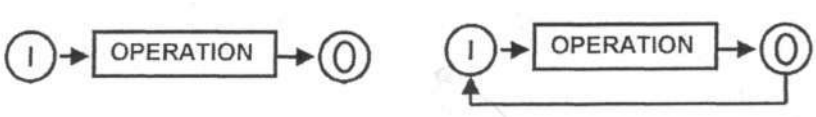


Figure la (left) and Figure lb (right).
Mere input-output analysis (left) versus feedback loop (right).

In modern interdisciplinary systems science, interconnectedness and feedback loops are crucial. Accordingly, the former description of the "conversation" misses the essence of what really takes place. The spouse has a relationship which reflects the history of that couple. Therefore, the man "knows" that certain answers might be interpreted by his wife in a way which he does not want. This belief, of course, influences the possible answers he might give a great deal. On the other side, "knowing" her husband, and that he tends towards "evasive answers," the wife tries to ask in a way that reflects these tendencies in order to find out what he really thinks. However, the man has experienced that his wife has developed the tendency to ask him in a special way and, therefore, tries to anticipate what he could do to avoid this. But the wife ...

We could go on telling this story in more and more detail and with more potential loops which reflect the experiences gained during thousands of previous loops (see Figure lb).

But even this rough example shows the flaws of a mere input-output analysis in contrast to taking account of the history of feedback loops in which cognitive patterns of beliefs, expectations, interpretations and so on provide a "meaning-field" (see Kriz 2006) that determines the questions and answers. Due to interconnections and history every stimulus is also a response to what happened before, and every response is also a stimulus for the further development of the process. Therefore, what happens reflects the pattern of interaction and meaning which has emerged in the biography of that couple. This pattern is not imposed from outside (although many influences are important: social and language structure, individual biography, personality etc.) but is self-organized.

It should be noted that even in this simple example we find the typical combination of bottom-up and top-down perspectives which is so important for the understanding of systems theory (and an adequate understanding of the processes in our world!): The patterns of interaction and the meaning-field have (bottom-up) emerged out of the single actions, words, gestures etc. while the pattern and the meaning field (top down) shapes and has shaped the process of actions, words, gestures etc. Moreover, we should be aware that the particular meaning-field of this couple has emerged within various environmental meaning-fields of our culture, their own special subculture, the family structures and narratives of the smaller social network in which this couple lives, and so on.

It was in accordance with this description, which is again in agreement with the thought of Oswald Külpe and the Würzburg School, that Gestalt Psychology (especially the Berlin School) developed its core concept of "Gestalt", which stresses that a structural whole integrates several elements in a dynamic manner (the "bottom up" perspective) while special features of the elements get their meaning primarily through being parts of the whole (the "top down" perspective). For example, a melody integrates individual tones, and can remain "the same melody" when transposed into another key because of the structural invariance of the relationships among the tones. A melody also gives special meaning to many of its tones — for example, the "key tone", the "leading tone," etc.

2.2 Circular Causality

Interdisciplinary systems theory describes and analyzes on a more general level how dynamic order or patterns emerge if input and output are not artificially isolated (as is the case in most classical and technical approaches). To give some examples from different areas of research:

- Laser: the extremely coherent light wave can be described by a process of self-organization which synchronizes the emission of light from the individual atoms in such a way that they contribute to a common light wave;
- **Chemical** Clocks: the phenomenon of self-organizing patterns of movement of a liquid in a bowl due to chemical reactions - when put into a test tube the color might change red-blue-red-blue-red-blue .... (like the pendulum of a clock: therefore the name);
- **Bénard Instability:** the hexagonal macroscopic, coherent movements (convection "rolls") in a liquid which typically take on the complicated shape of a honeycomb pattern "enslave" the movements of the individual molecules in such a way that they contribute to the common pattern of movement;
- **rhythmic applause:** the spontaneously arising common rhythm of clapping, which often emerges from the chaos of applause after a concert, synchronizing the individual clapping rhythms in such a way that they contribute to the common rhythm;
- patterns of interaction and interpretation in a **"marriage crisis":** the mutually structured climate of distrust, insinuation, misrepresentations and allegations which undermines the benevolent trusting interpretation of actions in such a way that this climate (i.e. cognitive-interactional field) dominates and shapes the thinking, perceiving, interpreting, and acting of each partner, enslaves the patterns of interaction, and contributes in turn to the farther development of a climate of distrust.
- **Corporate Identity:** the common imagination of the goals, values, and principles of a company (or other organization), which shapes the activities of smaller departments or individuals in such a way that they act in the spirit of this imagination and thus contribute to it.

All of these examples have something in common: Order parameters on the macroscopic level - which represent a field of structuring forces - are relatively stable (i.e. if they change at all, they do so only slowly) and "enslave" the microscopic dynamics. *This is the top-down perspective of the interrelation.* At the same time, however, the order parameters (and the field which they represent) are nothing other than abstract structural variables, to which all of the elements on the microscopic level contribute by means of their dynamics. *This is the bottom-up perspective of the interrelation.* Accordingly, the coherent wave of the laser is made up of emitted light (-waves) of single atoms; the highly ordered "rolls" of movement in the Benard Instability are made up of the movements of single molecules; the coherent applause rhythm consists of the hand-clapping of many individuals; the climate of distrust is composed of the interpretations and communications of each partner; and the "corporate identity" consists of the imaginations of the individuals involved.

In particular, the interdisciplinary systems approach *Synergetics* (Haken 1981, 1984) is presented in more than one hundred volumes with about two thousand contributions, most of them from physics, chemistry, physiology, biology and other natural sciences - a few from psychology and psychotherapy (see Kriz 1990, 1992b, 1993, 2001).

Therefore, it was Haken (1992), with reference to the circular causality between the field (described by the order parameters) and the micro-level dynamics, who emphasized that pattern formation and pattern recognition are to be conceived of as two sides of the same coin. If a part of the subsystems (or elements) is already ordered, a field is generated, which "enslaves" the rest of the system- thus completing the order. From this perspective, pattern *formation* takes place. The final (dynamic!) order is called an "attractor".

Orders are *"recognized"* the other way around, in that some features of the order similarly generate a field (or order parameters), which completes the further characteristics of the order in a "process of attraction" (cf. Fig. 2 with some of the above examples).

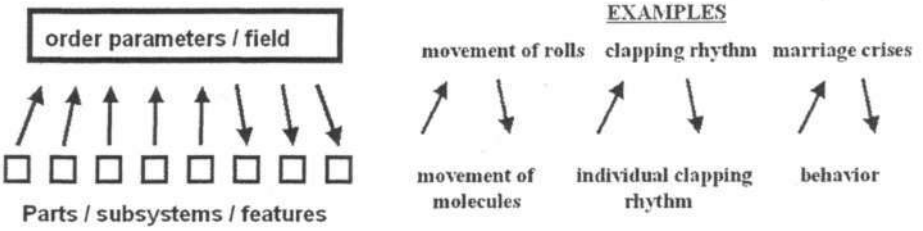


Figure 2: Circular causality.

The concept of "completion dynamics" is also relevant to cognitive processes. The macroscopic order is reestablished according to the field's order parameters. A classical experiment from Asch (1946) can, for example, be newly interpreted from this perspective. Asch was a proponent of the Gestalt psychological view, and therefore pointed out that the overall impression of a situation or of a stranger is not just a collection of various separate pieces of information. Rather, the given information is seen in a context and thus yields an organized whole.

Therefore, when we look at a person, a certain impression of his character emerges immediately in us. This corresponds to the completion dynamic. In one of Asch's richly varied experiments, a description of a person, in the form of a list of six typical characteristics, was read slowly to students. One group was presented with the following list: "intelligent - industrious - impulsive - critical- stubborn- envious". Another group was given the same list but

in reverse order: "envious - stubborn - critical - impulsive - industrious - intelligent". It was shown that the first group had a clearly positive impression of the described person afterwards, while the other group had judged the person in a clearly negative manner.

Often quoted in the literature as a "primacy effect", this finding can also be understood in the light of circular causality or completion dynamics, as shown in Fig. 2. The first characteristics generate an overall impression, which "enslaves" the interpretation of the further characteristics correspondingly - i.e. each in turn further completing the image of that person. For example, "critical" can be understood in a more positive or in a more negative way - or, more precisely, being part of a positively judged person or part of a negatively judged person.

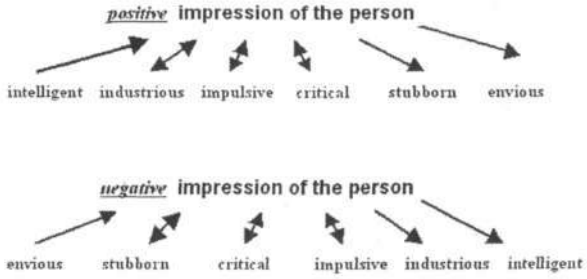


Figure 3: Asch's experiment, seen as a completion dynamic in a cognitive field (the directions of the arrows only illustrate the possible main directions of the forces).

These few examples should demonstrate the fruitfulness of the system-theoretical approach and its principles, even when applied to the reconstruction of psychological phenomena, findings, descriptions, and the associated dominant principles. On these grounds it stands to reason to attempt to apply this approach to the investigation of mental and/or affect-logical[1] completion dynamics. To this end, numerous experiments have been conducted in Osnabrück in the last 15 years, in which the attracting strength of the affect-logical processes was examined in quite different contexts (overviews can be found in Kriz 1999a, 2001, 2004b). Although we cannot go into details here, it should nevertheless be emphasized that in my opinion, an even larger range of psychological problems could be investigated with such experimental designs. An important question deals with the question of how "fields" with

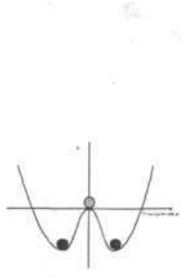
[1] I use "affect-logically" here, because the meaning of "cognitive" in former times included the entire cognitive process (thus, naturally, rational *and* affective components), but was then absurdly reduced in psychology to "rational-logical" aspects. As a consequence, one now has to readjust the analytical one-sidedness of this view with creative terms like "cognitive affective".

structuring operators are created or invoked from single pieces of information in the cognitive dynamic, which then lead in the further process to a clear completed order, in the sense of an image of "reality".[2]

2.3 Emergence

In order to understand the differences between the classical approach and Oswald Külpe's way of thinking, which anticipated the thought of modern interdisciplinary systems theory, we should take one small step further in analyzing the phenomena of holistic, complex influences or fields and self-organizing processes.

During self-organized formation (so-called "emergence"), the order parameters first develop in relation to competing possibilities of order by means of weak fluctuations. Some of these alternatives of possible order, however, do not represent the overall condition of the system and its surroundings as well as others - as a consequence, they lose the competition and their special contribution to the dynamic becomes weaker and weaker. Other alternatives lose the competition just by chance - the same chance that lets the ball go to the left or to the right side in fig. 4a. Both sides are equivalent alternatives. However, chance - in the form of the smallest fluctuations or "the butterfly's wing" (to refer to that famous metaphor) - breaks this symmetry of equivalent alternatives. However, when the ball has left the highly unstable point of equilibrium and moves - let's say - a little to the right side by chance, then, by necessity, the ball continues to go to the right side, falling down into the valley, because the forces become stronger and stronger until it reaches the valley. Although in many cases just two alternatives are typical (fig. 4a), landscapes of many more alternatives are also possible (fig. 4b).[3]



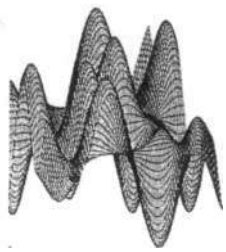


Figure 4a. Figure 4b.

It should however be at least mentioned that many further research paths exist for the demonstration of the correspondence between system-theoretical and psychological principles. Today, an increasing number of psychological researchers are involved. Overviews are given in Haken & Stadler (1990); Tschacher, Schiepek & Brunner (1992); Schiepek & Tschacher (1997); or Tschacher & Dauwalder (1999, 2003).

There can be very many alternatives if one takes multidimensional space with many dimensions or variables into account.

Accordingly, and also in our examples, the forces of order become stronger and stronger while the order establishes, and at the same time more strongly enslave the dynamics of the parts on the micro-level in a circular-causal manner ("autocatalysis"). Although these order parameters emerge in a self-organized fashion, they nevertheless represent the environmental conditions of the system in such a way that they represent one (of two or many) possible adaptations to these external conditions.[4] In most cases, this concerns the minimization or maximization of certain variables (or aspects), which coordinate the relations between the system and its environment. In the case of the laser, this concerns the maximization of the flow of energy; in the case of the Bénard instability, the convection movement becomes a maximum. Similarly, the clapping rhythm supposedly[5] concerns the maximization of the expressive group feeling; the marriage crisis concerns the maximization of the caution against harm and even more against "being the fool"; and in the case of corporate identity, it is a matter of the maximization of the feeling of coherence and clarity, in the sense of belonging to the organization in contrast to competing alternatives.

In the examples mentioned, the central aspect was that the self-organized orders were just in their nascence - still undergoing the so-called process of emergence.[6] In the fields of psychology and social science, however, there are many phenomena for which it makes sense to assume that the order and its order parameters have developed already before the relevant time-frame of observation, and that these order parameters display their effects now, in the current dynamic.[7] For example, the ordering principles with which an adult structures his relations to the world, to other people, and finally himself can be understood as order parameters, which emerged in early development through self-organization (but, of course, in relation to the environment). Specifically, the structuring principles for human relationships that were discussed within the context of attachment theory (Bowlby 1988) are to be understood in this way.[8]

[4] These external conditions arc represented by so-called "control parameters".

[5] The examples of rhythmic applause, marriage crisis, and Corporate Identity serve here only to analogously indicate the transferability of the concepts to such topics. Such a transfer, of course, requires a careful analysis and the definition of the exact processes and operations in order to enable more than mere metaphor. There isn't the space here to do this- I am, however, certain that it is possible, and in the case of the "clapping rhythm" example, this has already been shown to a large extent (sec Kriz 1999b, 2004, Néda et al. 2000).

[6] The Corporate Identity example should also be understood in this sense.

[7] Elsewhere (Kriz 1997b), I have pleaded for the differentiation between (a) structure emergence, e.g. formation of attractors, (b) structure representation through a dynamic process, and (c) structure representation through display.

[8] Some structuring principles - like the figure-ground differentiation, for example - have already even emerged in the process of evolution. However, in our considerations here they play no central role, as we share these principles to a large extent with all people, and they lie outside of our time-frame for self-organization processes.

Accordingly, the operators that play a central role in various approaches under the concept of "schema" are normally structuring principles which emerged already years ago. In the current processes of perception, cognitive processing, and expression (including actions and movements), these structuring principles actualize and unfold their shaping forces, which themselves act on the new material of cognition.

Already in the work of Bartlett (1932), who coined the term "Schema" and introduced it into psychology, the cognitive reception of complex and new material meant assimilation through existing schemata. Moreover, the act of memory requires an active "process of construction". In this process of remembering, existing schemata *are* used to construct compatible details. (This plays a central role in "Person-Centered System Theory" (Kriz 2004a), in the form of "completion dynamics".)

3. The Inconsistency of Külpe's Thought and of Systems Theory with Classical Science

We have discussed some fundamentals of modern interdisciplinary systems theory in order to understand how much this thinking is in contrast to and challenges the classical approach, which sees imposing and controlling order from outside the system as the only way in which processes are organized. Combined with this classical understanding of ordering is the approach which attempts to synthesize isolated elements (that have, perhaps, been carefully studied in a lab) into a more complex system, following a design or plan with respect only to logic - and thus neglecting the pre-structured possibilities of the holistic fields with which the emerging Gestalt has had to be in tune.

This exactly was the great achievement of Külpe and the Wurzburg School. They challenged the sharp critiques of the prevailing elementarists and associationists. As still often happens in contemporary debates, the ideas of reductionism were equated with the demand of being scientific. This is due to the classical thought that a whole has to be dived into its parts in order to be analyzed very carefully and precisely, while the same precision could not be achieved by studying the entire complex system.

It should be clear that the perspective of a more holistic approach to complex processes, systems theory and self-organization, is to some extent more a question of values and ethics than of effectiveness and "what works." In many cases the principles of imposing order work as well as the principles of self-organization. Take, for example, "rhythmic applause." The common clapping rhythm, which often emerges self-organized from the chaos of applause after a concert, *could,* of course, also be established in the "classical" way by intervention. Imagine a concert for the army. At the end, an officer jumps on stage practicing what he had learned in the army and heard from politicians,

teachers, or therapists with a "classical" world-view, namely that order has to be imposed. Shouting "wasn't it a nice concert?" he might make big clapping movements, adding "let's clap- now, now, now!" If the soldiers then follow, it is (again) proven that order *can* be imposed. However, most cases of rhythmic applause arise spontaneously, synchronizing the individual clapping rhythms into the common rhythm by self-organization.

Similarly, in case of the Bénard Instability, there is not any trainer for the "behaviour" of the rolls and not any teacher for the "right order" - although (as was typically thought in the classical understanding of "intervention") order could be introduced as "ordering" by external factors, for instance by someone stirring the liquid in such a way as to make the rolling movements. Instead, quite unspecific conditions of the system's surroundings (here: the difference in temperature) lead to the self-organization of this highly differentiated dynamical structure, which must be understood as an inherent ordering structure of the system itself. A designer, for example, may want to see eight-sided rolling movements (instead of six-sided), because he thinks that this would be much more aesthetic or creative - but as eight-sided rolling movements are not in the inherent structure of the system, they cannot be produced.

In the following we are going to discuss the big difference between the systems approach and the classical approach to "the world" in a way that is more detailed and that makes clear some underlying principles. The controversial understanding of the "the world" can be schematized by Figures 5a and 5b

Figure 5a (left) and 5b (right).
Schema of classic-mechanistic approach (left) versus systemic-dynamic approach (right).

The core idea of the classic-mechanistic approach is organisation from outside. Forces - or *interventions* - cause the system (box on a plane, Fig. 5a) to move from A to B. Just as easily the system could be moved to any other point between A and B (which represent other states of order). Moreover, it could be moved in the direction of C, etc. What happens is only dependent on the exact dosage of the forces - that means it is dependent on the size and direction of the forces. Whatever happens is a direct and specific result of the interventions, and by analyzing these cause-effect relations we try to control the further development. Moreover, all points in that plane are "equal" - a homogeneity, totally open to the will of a designer.

The core idea of the systemic-dynamic approach is, in contrast, self-organisation. Due to non-specific conditions of the environment (forces which form the landscape of potentials) the system (landscape with ball, Fig. 5b) develops a dynamic state of order or an *attractor* (the ball rolls to point B). Order is not inserted or imported from outside but is an inner possibility of the system. The forces can only support landscapes which are specific to the system- and the ball can only roll to C or to B. Therefore, we find discrete states - reflecting the *uniqueness* of the system and its potentials. Instead of openness to a designer one has to respect the peculiarity and characteristics of the system as well as the specific history.

The underlying principles of the classic-mechanistic approach are control, homogeneity, ahistoricity or lack of respecting the historical context, linearity and continuity, local causality, and statics. We should examine these principles a little further:

Control: This is one of the main principles of classical Western science. Before the 17th Century (as well as in many other cultures even after this time), the desire to understand the world was motivated by a desire to act in harmony with it. This happened against a religious backdrop of a reverent *attempt to understand* the structure of God's creation - the "harmonices mundi". Then, during the Age of Enlightenment, *there was a push for the idea of man himself as creator.* An understanding of Nature and its principles was now something that was needed in order to control Nature and to allow man to *"make"* something. Instead of *trust* in the principles of self-organization and their *support,* the emphasis was now only on the methods of *control.*

It should be noted that the principle of "control" naturally suites the conservative ideology of the *rich* and powerful extremely well by *(promising to)* secure their *wealth* and power. The apparently necessary use of control to prevent chaos and anarchy justified - and today still justifies - the use of controlling bodies like the police and military to *maintain these states where the rich stay rich and the people in power stay in power.* Although self-organization would possibly bring about better solutions for the society as a *whole,* it could also mean imposing restrictions on the powerful position of the "controller". It is no accident that after devoting all available attention to the control of order and its tendencies to disintegrate and to decay (thermodynamics), it took at least another century before science began to investigate and discuss the autonomy of order (the theory of self-organization).

Homogeneity: Analysis, synthesis, and homogenization are important aspects of the technology of control. Through these aspects, a whole is stripped of its structure and reduced to homogeneous parts. These parts are then analyzed, and synthetically (and according to human design-based creative ideas) reassembled into a whole - mostly ordered in a different way. Concrete, which is moldable in any number of ways, comes from ground up stones whose

individual structures are lost; hardboard comes from grown wood, devaluing its structure. In the same way, some make an attempt at creating a unified psychotherapy synthesized out of "effective factors", harvested from the psychotherapeutic landscape of grown *approaches,* which represent different approaches to life.

In the history of science, the paths of the planets, which for Kepler still represented the "harmonices mundi" in their intrinsic structure, became an *arbitrary* realization of mathematical equations according to Newton's understanding of nature. According to Newton, everything is equally valid (and thus *unconcerned with particularly special* intrinsic structure). Today we know that Kepler was at least as correct as Newton: Due to feed-back and resonance effects, there are discrete classes of stable "planetary *solutions",* and the universe itself is therefore not as *arbitrarily indifferent* as Newton and classical Western science would have us believe.

Ahistoricity or lack of respecting the historical context: The classical trend of describing nature by means of equations is not only found in the study of space, but also in time. *Calculating the timing of a solar eclipse gives an answer that may lie in the past or in the future - for example, 2000 years ago or 2000 years in the future.* Effects and their paths are, to a large extent, reversible, and thus without a *specific historical context.* This is another principle which Modern system theory refutes for *essential events in nature.* Here, irreversible processes are typical and important. Many developments are dependent on time and give a *specific history* to the system.

Linearity and continuity: The guiding principle of "natura non facit saltus" (nature does not make leaps), formulated by Leibniz, has already been disproved on the micro-level by quantum mechanics - as seen there, nature *only* makes leaps! However, this affected our understanding of everyday phenomena very little. In contrast to this, we find that the typical qualitative leaps that are described in the context of modern system theory are indeed relevant to our everyday life. Moreover, they apply to all systems, provided that they are not artificially isolated and closed to feed-back. This means that they pertain to almost all of nature, particularly the field of the living beings. Depending on the history of the system, small "causes" can have considerable consequences, and large "causes" can likewise have almost no consequence. In the context of emergence, completely new qualitative aspects of the system can suddenly *arise.* The usual linearity of cause and effect, and the continuity of the course of a development are thus no longer *given.*

Local causality: According to the classical conception (and, in addition, also in the context of control), cause and effect are locally *associated. This* means that the effect occurs exactly where *an intervention is done.* A typical example is *hammering out a dent in a* tin can.

This model is, however, inadequate for dynamical systems (including life processes) - the structure of a waterfall, for example, can't be changed by *"hammering"*. What must be changed are the *environmental conditions* under which a system *selects and reaches* another inherent organizational structure through self-organization (this process is called "phase transition"). This is, of course, not "non-causality" - however, it is a fundamentally different conception of causality, than "hammering".

Statics. Classical conceptions involve statics and stability (seen in this light, it would actually make more sense to call *thermodynamics thermostatics)*, which is naturally connected with a certain interest in utilization (the energy yield of machines, for example). A typical reification of processes is also involved- sickness, *behavioral disorders,* rain, fire, etc. are all nouns, and therefore "things", although they actually describe processes. On the other hand, this is narrowly connected with the fact that often it is only a *change* in such "things" that seems to need an explanation (because without any affecting influences, "things" stay exactly as they are). From the perspective of dynamic systems, however, it is exactly the *stable points* of processes that require explanation. Not the transitions from "healthy sick" (pathology) and "sick healthy" (therapeutic or medical treatment), but rather also "sick sick" (question: what conditions have to be present for a "sick" system to remain "sick"?) and "healthy healthy" (which, until recently at least, was seen as no more than a tangible matter of course and *was focused upon* as "salutogenesis").

The classical principles may be adequate when one is beating out the dents in a tin can or repairing a defective engine. However, these principles are inadequate if one is making an intervention with a living being or even working with a patient in a psychotherapeutic manner (Kriz 2006), because these principles define a context which *deprives mankind of the* following aspects:

Trustworthiness: Here, as emphasized above, trust is replaced by control. Accordingly, one finds many more programs in psychotherapy for the *improvement* of self-control or self-management than of self-confidence. Also, "loss of control" is thought of and feared more as a disturbance than as a loss of trust.

Individuality and uniqueness: In statistics, diagnostic categories, *efficacy measures etc.*, people and their life *stories* and their *ideas about existence* as a rule no longer, appear. In light of these approaches, individual destinies are all considered to be equal, and thus equally unimportant.

Historicity or respect for the historical context: Beyond a diagnostic "status quo", the patient's life history is no longer *significant.* And so, in *manual-based* therapy for example, proving the efficacy for a given diagnostic group hinges upon the similarity of the people *being treated within a group* (otherwise, one couldn't make so much of a scientific fuss about which

group has been "scientifically" "proven" to respond to the treatment, and which group hasn't). Seen from outside, and considering non-linear phase transitions in processes of change, this is already inadequate. From the "first-person perspective" however, *"historicity" expresses* an essential aspect of *"meaning/illness"* with which a person existentially places himself in his world. However, this aspect is supposed to be irrelevant in the proof of efficacy mentioned above.

Non-Linearity: Creative development and healing processes, that proceed in a non-linear, erratic, non-locally causal (see above) manner, are not provided for (it would make no sense, for instance, to calculate arithmetic *means of* effect values for groups, if serious qualitative jumps in the relation of cause and effects are part of the calculation). Nevertheless, such developments are typical and essential for humans.

Integration of Context: The many diverse interdependencies are ignored *in favor of* artificial isolation. This is not only for *pragmatic* reasons - everything couldn't possibly be taken into consideration (as is ultimately true for every statement) - but also for *ideological* reasons. Once again, taking contexts into consideration would lead to the necessity of observing exactly those effects of non-linear, emergent, non-locally causal therapeutic development processes which the classical *methodology* would immediately reduce to the absurdity of being inadequate and *over-loaded with* research artifacts.

4. Systems Theory and Humanistic Psychology

If we take these aspects seriously, then we must take into account the principles which were a core of the thinking of Külpe and his Würzburg School a hundred years ago, that were later formulated by the Gestalt psychologists, and are nowadays the principles of systems theory as well as of humanistic psychology. Again, it is not only a question of "what works better" or "what is more effective". It is as well a question of ethics - or better: our answer to the question of how we want to live as human beings.

Werner Heisenberg, the winner of the Nobel Prize for Physics, said this most aptly in a striking statement: "When we talk nowadays about the world-view of the exact natural sciences, we no longer refer to a picture of nature, but to a picture of our relationship to nature". From this statement the question arises: What picture of our relationship to the nature of human beings do we want to draw as psychologists?

I have discussed more thoroughly elsewhere (Kriz 1998) that fifty years ago Wolfgang Metzger summarized "the six characteristics of working with living beings" which also formed the fundamental principles of the Humanistic Psychology of that time. Remarkably, these characteristics - earlier discredited

by opponents as "lyrical" and "too unscientific" - correspond very well to the principles of modern scientific systems theory as it is described today. Without going into details, this correspondence is described by means of a comparison in Table 1.

Humanistic Psychology	***Modern Natural Science***
"Six characteristics of working with living beings" (*after Wolfgang Metzger 1962*).	Core principles of interdisciplinary systems theory.
1. Non-arbitrariness of Form:	
One can't impose anything on the living being in the long run that is against its nature, one can only bring to development that which is already inside the "material" itself as a possibility.	One can't impose just any arbitrary form on a system; rather one can only support the organisation dynamics which are inherent to the system.
2. Formation and creation from inner power	
The power and drives, which actualize the forms, fundamentally have their origin in the living being one cares for.	The decisive variables of order – the so-called order parameters – essentially have their origin in the system itself.
3. Non-arbitrariness of working time	
The living being can not arbitrarily wait for support and nurture. It mainly has its own fruitful periods and moments for change.	Systems have a "history", relative to which "the same" interventions sometimes have no effects; however in other phases qualitative jumps can be caused.
4. Non-arbitrariness of the speed of work	
The processes of growth, maturity, survival of an illness, etc., evidently have their own specific speeds of development.	Phase transitions – which are perceived from outside of the system as significant qualitative changes in the dynamic structure – have system inherent ("specific") progressions.
5. The tolerance of detours	
One must accept detours everywhere.	The paths of development must be respected (e.g., a path through a bifurcation cannot be "shortened").
6. The reciprocity of events	
Events are reciprocal. In the most impressive cases, it is an encounter of "partners of life".	Systems are not only characterized by the reciprocal connections of the "elements" or sub-dynamics but the division into system and environment is purely analytic-formal. Every separation and exclusion of holistic interaction is a simplification (which may be necessary, when/if required).

Tab.l: Correspondence between principles of Gestalt and Humanistic Psychology and of modern interdisciplinary systems theory.

5. Külpe's "anticipatory schemata" and the teleological principle in systems science

One of the most inspiring findings and concepts in modern systems theory is the notion of an attractor. With regard to an attractor, the dynamic forces - what "causes" the process to have a special order - are not pushing from behind but pulling from ahead. This is a fascinating and new insight because over the last few centuries it was seldom done in science (and Only far away from the mainstream) to think in terms of such a teleological principle, a principle that means accepting forces that pull from in front, from the future, instead of pushing from behind, from the past.

Of course, the Aristotelian notion of "entelechy" focuses on such teleological principles; and Goethe, Spinoza and William James have provided the seedbed from which this thinking germinated in the 20th century. Therefore, the perspective of Külpe and the Würzburg School - especially the "anticipatory schemata", which has been coined by Külpe's pupil Otto Selz - was not entirely brand-new, of course.

However, until quite recently all these approaches, theories and ways of thinking were far from being accepted as "scientific" in a strict sense - at least in the area of the natural sciences. The idea that a cause is pulling from ahead and, therefore, is effective from the future seemed to contradict the "normal" principles of causality and, as a consequence, to threaten the foundations of science. Now, as a result of the "attractor" concept, it has returned again with dignity to modern natural science.

It should be stressed that speaking about forces "pushing from the past" or "pulling from the future" is, of course, not an ontological but an explanatory statement. Therefore, teleology is no more and no less than a principle of explanation- however, this is also true for our classical understanding of causality. As a consequence, teleology and classical causality have the same status.

In order to discuss this point more clearly, let us go to a statement of the physicist Haken (which we used already in a modified manner at the beginning) describing the attracting self-organization of a laser: "When part of the laser atoms are in an ordered state so that they produce a well-defined coherent laser wave, this laser wave acting as an order parameter may enslave the rest of the laser atoms to form a total state in a well-ordered fashion" (Haken 1992: 46). We can see the idea of completion dynamics and the forces of the attractor which "pull from ahead" in a teleological manner. With respect to the dynamics of laser atoms this perspective might be seen to be too sophisticated or even exaggerated. One could argue that the dynamics could as well be described by

using the forces "here and now" - and the term "future" would make no deeper sense (or, moreover, would be misleading).

Even if I would concede part of this argument in the case of dead matter, the importance of "forces from the future" comes into our discussion again with respect to cognitive and interactive dynamics - especially, with respect to imaginative and creative processes which are, undoubtedly, essential for our world as human beings. When we ask a student who is going downstairs (in a university building) to a special lecture: "Why are you going?" we would find the following explanations very lousy: "due to gravity", or: "due to the impetus of my movement". We also would question the (past oriented) explanation: "because I decided yesterday to do that"- asking: why did he make this decision, what were his expectations? Wouldn't it just be the most simple and satisfying (future oriented) explanation when he says: "because I want to hear the lecture of Prof. X"? Here the expectations or imagination of future states are indeed very important in order to understand the dynamics.

Without going into mathematical and technical details, we can say, that an attractor is the final structure of a process towards which the dynamic tends. So, when we start this process from different initial points (or "situations") it always tends toward the same end-structure (or end-"situation"). From the perspective of established order, one can also say that a still very incomplete order becomes increasingly completed during an attracting process (the so-called "completion dynamics"). Without going into detail here (see Kriz 1992, 1999a, b), this process can be illustrated as in Fig.6.

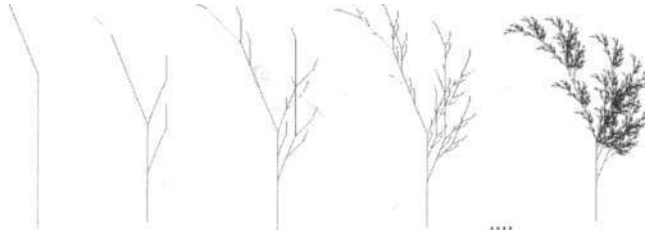


Figure 6: Recursion of one simple geometrical operation.

Corresponding to Fig. lb, only one simple operation is carried out on the first picture on the left. The same operation is then performed on the result (second picture from left), and so on. After just six such repetitions ("recursions"), the picture on the right already appears. This process of development - which could even be called the "unfolding" of the ordering potential of this operation - is indeed very different to a step-wise linking of lines. Therefore Fig. 5 also makes clear what it is that is special about the dynamic principle of developing order, as compared to the classical analytic-synthetic

idea of order. Of course, the plant-like image on the right can be produced using the "normal" conception of order (and classical geometry) by means of a long series of instructions of the following form: "draw a straight line of x cm; then after y cm from the starting point move to the right by z degrees and draw again..." One would need very many such instructions, but in principle it is possible to use this method to produce exactly this drawing. In fact, it's possible that there are many people who might regard this as the only possibility of producing it. Moreover, in the step-wise production every step can be controlled and compared to the final picture in order to detect errors and to correct them.

In the dynamic of unfolding, in contrast, one has to trust that the final order will emerge, because for many iterations (or: for a long time in the process) it is not so evident that the process will really arrive at that form (especially when the forms are more complex - for example a photo of a face). And, as we already discussed, for many people (and organizations) it is much more comfortable to control than to trust.

By implementing such development processes in a computer program and using more complex end-pictures, it becomes clear that a holistic-intuitive means of access can already grasp and "anticipate" the emerging order at a rather early stage.

Figure 7: Recursion of more complex geometrical operations
(but in general the same procedure as in Fig. 2b and Fig. 6).

In Fig.7 a very slight development of the order - that is, a very small part of the final information - could be seen and completed intuitively in order to arrive at the final picture. But the ordering forces increasingly manifest the order in a way that can be discerned by a cognitive system. Subjectively, the order - that is the figure - appears "as if out of a mist". It is not a case of "clear detail" after "clear detail" that fit together into a whole. Rather, a holistic shape

forms from the beginning - a shape that is, however, very unclear and blurry at first, gradually becoming clearer.

From this perspective, intuition can be characterized as the ability to grasp developing or unfolding order in its essential aspects and as a complete whole, even in the early stages of development, when this order can only later be fully described in an analytic way.

In this context, I would plead for a more • equal balance between the normally overemphasized planning of actions and the completely undervalued imagination.

Planning follows clearly defined aims and goals along pathways that normally preclude any deviation from the original prognosis. This is an element typical of our classical western view of the world and naturally important and productive in the appropriate context. Imagining the future, on the other hand, is a typical example of a cognitive dynamic with a systemic attraction. Moving towards a goal, perhaps some professional aim, we have only a vague idea about the concrete realization. For example, if one wants to become a professional psychologist, it is rather vague at the beginning of one's studies what the job will really look like in five years. Moving towards this vague goal, however, there are decisions to be made along the way that then clarify the goal.[9]

This process of approaching a goal leaves room for creative and flexible adaptation to the givens, but also to unforeseen developments, changes, and disruptions in peripheral conditions. On such a path, deviations pose no difficulties and will not be seen as unpleasant surprises standing in the way of some precisely defined plan. On the contrary, even major corrections to one's plans are normal and to be expected. Instead of controlling the plans and goals and trying to avoid diversions, detours and surprises, the main moving forces here are openness, creativity, flexibility, and a search for meaning.

It is not my intent to set one principle against the other, as both have their own justification for being, just as dynamics and stability are oppositional but equally necessary. I do, however, wish to critically question a one-sided emphasis on planning in preference to imagination. It is precisely in times of upheaval and change that flexibility and creativity are more likely to be appropriate and successful than the controlled security of precisely defined plans.

From the viewpoint of existential philosophy, people have to create their future, and the discussion of imaginative goals, orientation, and values is

[9] This corresponds to modern systems theory: The attractors become clearer and more detailed and precise as the attractive dynamic develops the system in the direction of these attractors (see Kriz 1999b, 2001).

undeniably important. The well-known Viennese psychotherapist, Victor Frankl, was a specialist in the search for the meaning of life. In his report of his experiences in a concentration camp, he referred to Nietzsche's statement "One who has a why in life, can bear almost any how" (Frankl 1984). This 'why' also implicitly contains an imaginative-teleological 'for what' and, therefore, an orientation towards values.

Finally, it should be emphasized that Külpe's position of-studying complex cognitive processes, which takes concepts such as "anticipatory schemata" into account, is also supported by modern cognitive science. There is a lot of evidence and much research has been carried out - especially by Julius Kuhl and his group in Osnabrück (cf. Kuhl 2001) - which shows that activation of the right hemisphere, more specifically of the right frontal lobe, supports the function of the "extension memory". This is a system providing implicit representations of extended semantic networks, specializing in parallel-holistic and poly-semantic information processing. According to Kuhl's PSI theory (Personality Systems Interactions), which itself integrates a lot of research and findings of others, the activation of these extended associative networks may be regarded as the functional basis of intuitive judgements. The parallel-distributed processors are capable of handling vast amounts of complex information at speeds that greatly exceed the capacity of the conscious mind. And these parallel-holistic, poly-semantic, and integrative processing characteristics make the right hemisphere especially suited for processing integrated self-aspects or self-images (cf. Baumann, Kuhl & Kazén 2006).

The left hemisphere, in contrast, is specialized in analytical, sequential and "monosemantic" (i.e., unambiguous) information processing. According to PSI-theory, a system called "intention memory" (Kuhl & Kazén 1999) is specialized in the analytical-sequential processing of verbal information and explicitly formulated goals. Activation of this system may help to maintain the cognitive representation of intentions, but it may not necessarily help in checking the self-compatibility of goals. Baumann, Kuhl & Kazén (2006) additionally point out that in order to make progress on a planned action, cognitive processing has to be reduced to information that is relevant for the imminent action.

A lot of research on PSI theory shows that the activation of right-hemispheric processing is related to mental health and well-being. For instance, it protects persons from falsely attributing assigned goals as being self-selected (Baumann, Kuhl & Kazén 2006) and facilitates self-integration; while, on the contrary, a deficit in right-hemispheric functioning is associated with several pathological processes. For example, Weinberg (2000) has proposed that the production of a shift to left-hemispheric functioning is involved in the pathology

of suicidal persons, which includes disintegration of self-representations, personal memories of an overly general nature, and alienated and negative perceptions of the body.

In our context, it is important that activating the right hemisphere - and hence facilitating self-integration-can be done by focusing the cognitive activities on holistic, intuitive-creative activities as well as by body-sensing. Although these findings should be discussed in much more detail - for example, the relationship of these processes to personality dispositions (cf. Kuhl 2001) - it is remarkable how much they are in agreement with our discussion of sequential, verbal and categorical as opposed to holistic, dynamical and intuitive processes.

Still, there is a lot of work in order to overcome inadequate reductionistic and mechanistic principles and metaphors and to establish the more dynamic and holistic thought of modern systems science in psychology and related disciplines. However, Külpe and the Würzburg School anticipated much of this development, already one century ago. Being aware of this, the great achievement of Oswald Külpe's thought and approach has to be valued.

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