Peter Hollitzer

Explanation of the universal schema

Status: January 2024

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Summary

The Universal Schema is a minimal yet comprehensive model of thought that integrates quantum theory as a theory for probability forecasts for arbitrarily decidable alternatives. With the Universal Schema, knowledge relationships based on experience and observation are modeled. The modeling of knowledge relationships is the prerequisite for explaining phenomena. The understanding and application of the Universal Schema can be described as banal, as people intuitively grasp knowledge connections, i.e., without conscious reflection or logical deduction.

Peter Hollitzer - Head of Development, Universal Schema

Professor Walter Dürr

Walter Dürr (born August 5, 1936, † December 25, 2022) was appointed Professor of Education at Freie Universität in 1975. In the last few years of his research activities, Professor Walter Dürr studied the theories of Carl-Friedrich von Weizsäcker with the aim of relating theories of self-direction to organisational culture and action evaluation in company training.

In the essay 'The Term of Self-Directed Learning' dated November 5, 2001, Walter Dürr presents a theoretical approach to explaining the term of self-direction under the title 'The Term of Self-Directed Learning in Theory and Empiricism.

Original in German language:

„Selbststeuerung erkläre ich mir im Rahmen der Theorie der Selbstorganisation als Zusammenwirken von Handlungsweisen/Praktiken, deren Funktion, d. h. des Sinns dieser Praktiken und der sie ermöglichenden syntaktischen Struktur. Sofern diese Dimensionen der Information, Syntaktik, Semantik und Pragmatik sich als wechselseitig aufeinander bezogen erweisen, kann angenommen werden, dass sie sich in Kohärenz zueinander befinden, ein Ordner bzw. ein Ordnungsparameter entstanden ist, der den Gesetzen der Synergetik genügt. Wechselseitige Übereinstimmung mit den äußeren Bedingungen der Existenz bedeutet Korrespondenz.“ (Dürr 2001, 4)

Original quote translated into English:

In the context of the theory of self-organisation, I explain self-direction as the interaction of modes of action/practices, their function, i.e. the sense of these practices and the syntactic structures that enable them. Insofar as these dimensions of information, syntactics, semantics and pragmatics prove to be mutually related, it can be assumed that they are coherent with one another, that a folder or an order parameter has been created that satisfies the laws of synergetics. Mutual agreement with the external conditions of existence means correspondence.

Walter Dürr has schematically represented the explanation of self-direction within the framework of the theory of self-organization. Since this scheme can represent the

connection of phenomena in a standardised form, it is universally applicable and thus it is the precursor model of the Universal Scheme.
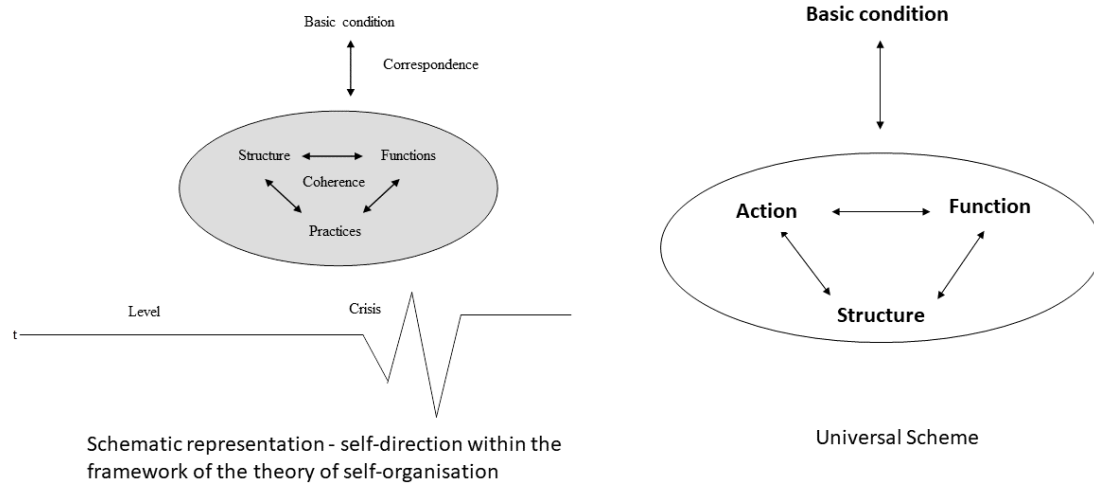
Figure 1 Schematic representation of self-direction - Universal Schema

The precursor model of the Universal Schema has set the framework and provided the conceptual horizon to develop the Universal Scheme.

Universal Schema
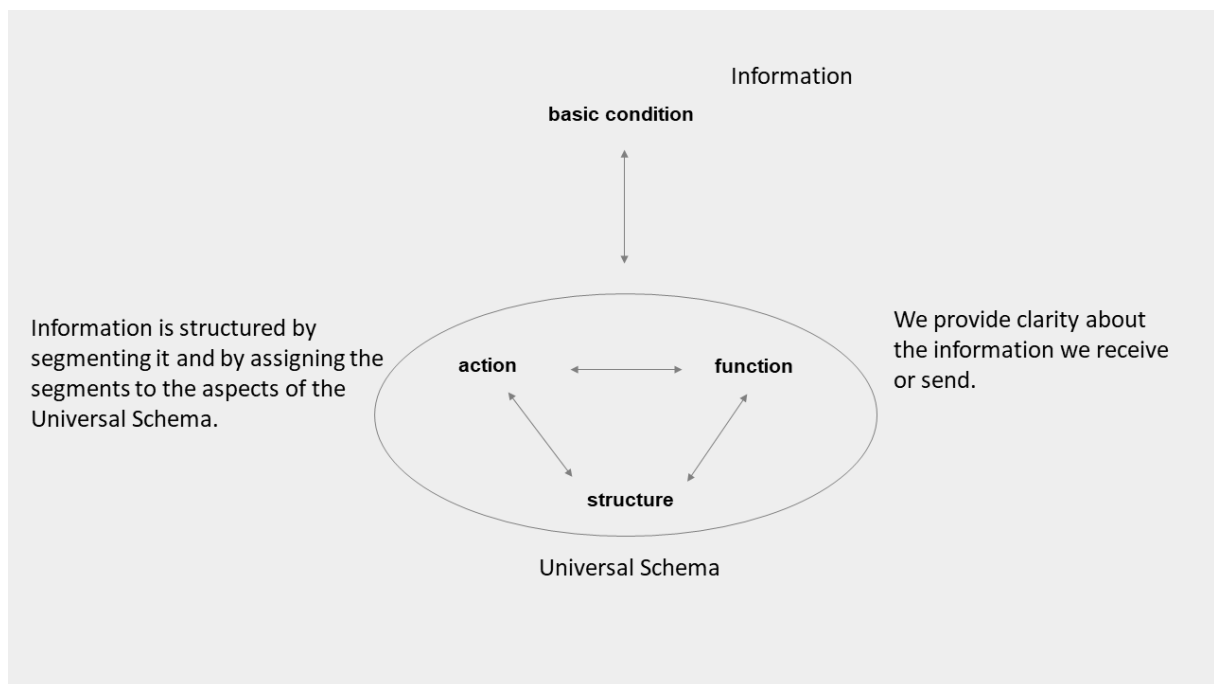
Figure 2. Universal Schema with explanation

The Universal Schema is used to structure information by segmenting it, i.e. dividing it into individual segments. These segments are then assigned to the aspects of the Universal Schemas structure, actions, function and general conditions. In this way, we create clarity about the information we receive or send.

Structures generate actions. *Actions* are associated with finite periods of time in which something happens. *Functions* are triggered by actions and explain why an action happens. Functions show the possibilities and facts created by actions. *Basic conditions* shape the interrelation of structure, action and function.

By assigning the segments to the aspects of the Universal Schemas, information is schematically unified.

The exchange of information based on the Universal Schemas offers the possibility of reducing misunderstandings. Misunderstandings can arise, for example, if it is not clear from which perspective a topic is being discussed.

Segment 4
basic condition

Segment 2
Segment 3
action — function
structure
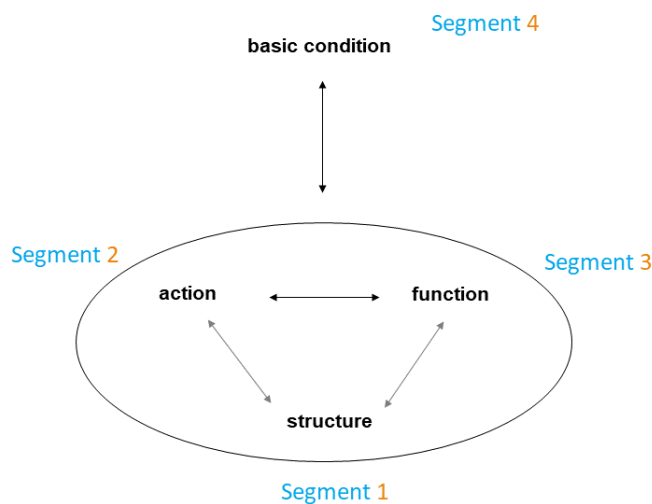
Segment 1

Figure 3. allocation of a segment

The utterance: „*I have the impression that we are talking past each other*" can be an indication that several people are talking about a certain thing without being aware of the perspective from which the respective other person is discussing this certain thing. A perspective is created by assigning a segment to an aspect of the Universal Schema. Aspects are perspectives or reference points to which segments can be assigned.
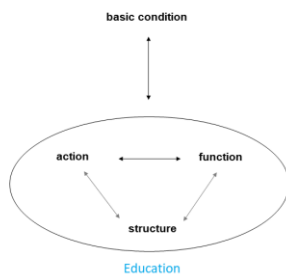
Figure 4. assignment „education" Structure
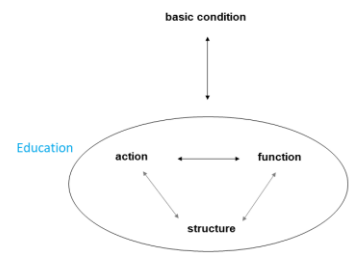
Figure 5. assignment „education" Action
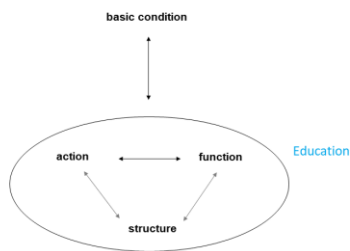
Figure 6. assignment „education" Function
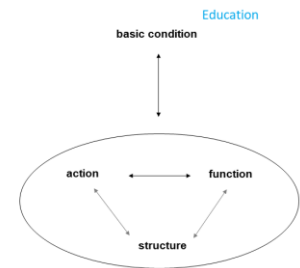
Figure 7. assignment „education" Basic condition

I can assign the term „education" to the aspect „structure", „action", „function" or „basic condition" and thus obtain four different perspectives from which the term „education" can be discussed.

The universal scheme is a minimal but comprehensive model of thought.

The significance of the „Universal Schema" thought model lies in the possibility of generating knowledge correlations in our consciousness and thus promoting an understanding of the interrelation of phenomena.

Phenomena are something we observe or perceive. We can observe behaviour, we perceive feelings. We observe living beings taking in food, we are happy about a compliment.

Understanding the an interrelation of a phenomenon is a necessary prerequisite to be able to explain the phenomenon.

A simple example will be used to show how the term „living being" can be represented and explained with the help of the Universal Schemas.
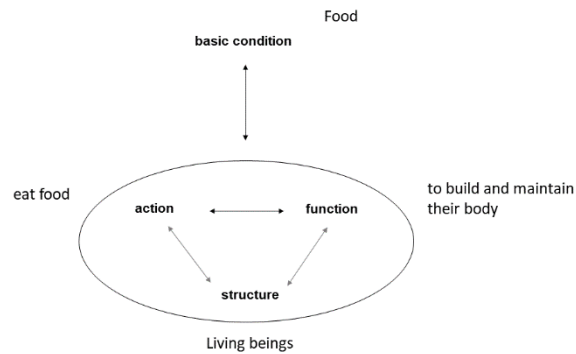
Figure 8. Illustration of the assignment of living beings

One action that is produced by living beings is the ingestion of food.
The explanation of why living beings take in food is assigned to function and is as follows: Living beings take in food to build and maintain their bodies.
The basic condition for food intake is that food is available.

Everything is information

The philosopher Gernot Böhme explains: „Information is always structure with meaning." (1976, p. 18) The physicist and philosopher Carl Friedrich von Weizsäcker argues that information is only that which generates information. (cf. 1988, p. 575)

Figure 9 Traffic sign

The unification of these two statements into one sentence is the justification for the assertion: „everything is information".
Information is structure always with meaning and information is only what generates information.

A traffic sign, for example, is a structure with meaning. Therefore, it is information. If I don't see the traffic sign, then the information of the traffic sign has not generated any information for me.

Sources:
Böhme, G.:
1976 „Information und Verständigung", Ernst Ulrich von Weizsäcker(ed.): Offene Systeme I Beiträge zur Zeitstruktur von Information, Entropie und Evolution. Stuttgart Klett Cotta.

Weizsäcker, C. F. v.:
Aufbau der Physik. Munich 2002. 4th ed. Deutscher Taschenbuch Verlag GmbH & Co. KG

Thinking aid and question strategy

We can also have used the Universal Schema to structure our thinking.

In order to structure our thinking and make us aware of knowledge connections in order to understand them better, a „thinking aid" and a „questioning strategy" can be used. Both instruments serve to organize and improve the thought process.

Thinking aid
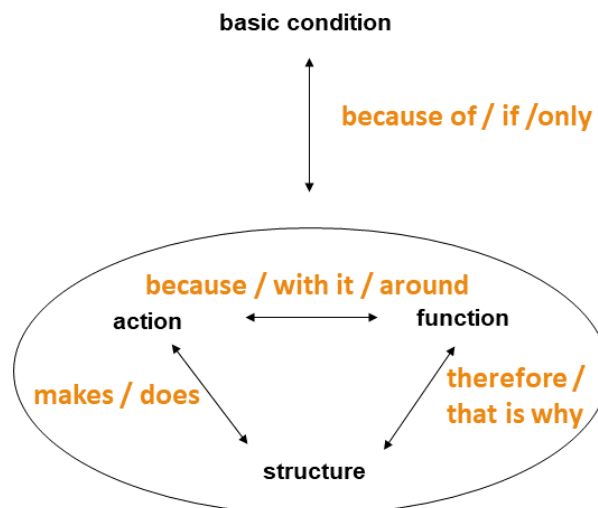
Figure 10 Thinking aid

The words „makes / does", „because / with it/ around", „therefore / that is why", „because of / if / only" are initial words.

Initial words are triggers or cue words that can generate cognitive, i.e., mental images in our brain and can trigger certain thought processes. The activation of mental images can help to process information better in the brain.

The words „makes" and „does" are verbs that are used to describe an Action or a task that is produced by a structure.

The words „because", „with it", and „around" are conjunctions, that is, connecting words that introduce subordinate clauses.

The word „because" is used to indicate the reason or cause of a action. The words „with it" and „around" are used to describe the purpose or goal of a action.

The words „because of", „if" and „only" are conjunctions, i.e. linking words, or prepositions, i.e. ratio words.

The word „because of" is a preposition that indicates the reason or cause for the interrelation between structure, actions and function.

The word „if" is a conjunction and is used to describe a condition or prerequisite for the occurrence of an interrelation of structure, action, and function.

The word „only" is an adverb, i.e., a modal or circumstantial word, that indicates a restriction or limitation upon which the emergence of the interrelation of structure, action, and function depends.

The terms „therefore" and „that is why" are adverbs, i.e., modal and circumstantial words, that are often used synonymously. They introduce a rationale for why the structure has produced an action and help in structuring and explaining the logical flow of the interrelation of structure, action, and function.

Figure 11 Thinking aid - application example of living beings
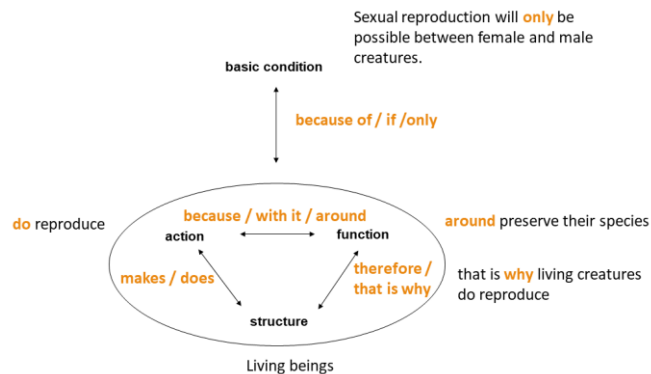
Thinking aid - example of living beings

Living beings do reproduce arround preserve their species. That is why, living beings procreate. Sexual reproduction is only possible between female and male living beings.

Question strategy

A questioning strategy is a planned approach to obtain information about phenomena or processes through targeted questions. Furthermore, the questioning strategy can promote understanding of the relationships between phenomena.
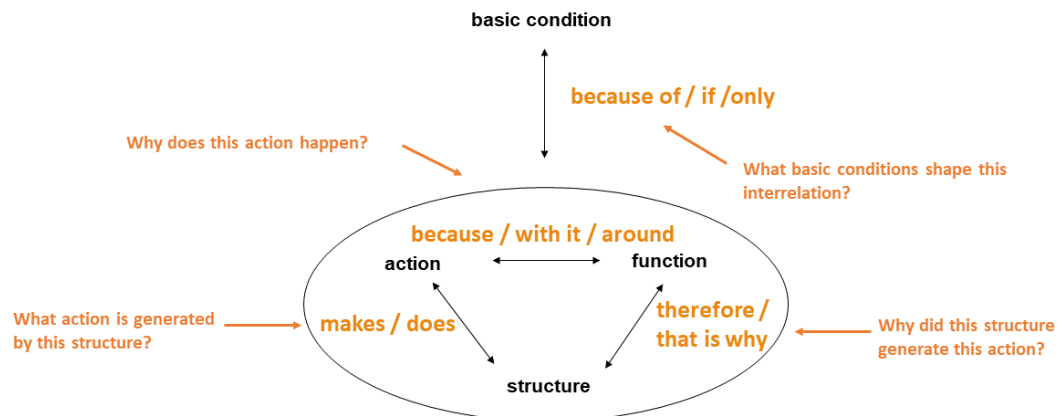
Figure 12 Thinking aid and question strategy

The answer to the question „Which action creates this structure?" is the description of the action or actions that create this structure. Actions can be described abstractly, or as a sequence of events in a concrete situation. A sequence is the order of what happens over a period of time.

The answer to the question „Why does this action happen?" is the description of the Incidents and sequences that have occurred in this action.

The answer to the question „What conditions shape this Interrelation?" is the description of the factors and conditions that influence or shape the interrelation of structure, action, and function.

The answer to the question „Why did this structure produce this action?" describes the characteristics of the structure that generated a specific action.

Benefits of the Universal Schemas and application examples

The Universal Schema can be used for various purposes.

For example, as a memory aid, as a mnemonic device or for memorising, i.e. for memorising and reproducing information.

We may be able to better understand new information and store it in long-term memory if we use the Universal Schema to structure this new information.

If we memorise the Universal Schema, the Universal Schema can become our „inner eye". We can use this „inner eye" to link the information that we have stored in our memory. This enables us to structure our existing knowledge and call it to mind at a specific point in time.

The Universal Schema can be used to structure written work and lectures. The Universal Schema can also be used as a template for presentations.

Application examples

Application example - Pablo Escobar, folk hero or criminal?

A student group from a year 10 class had the task of giving a presentation on the subject of Pablo Escobar, popular hero or criminal.
The students used the Universal Scheme for this purpose.
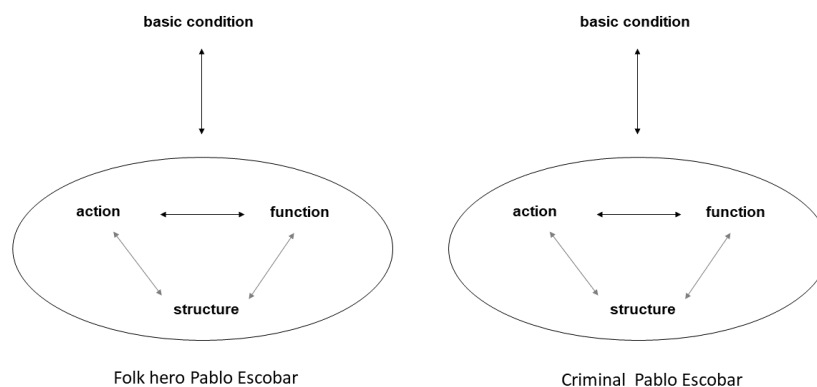
Figure 13 Pablo Escorbar folk hero - criminal

Explanation of the universal schema
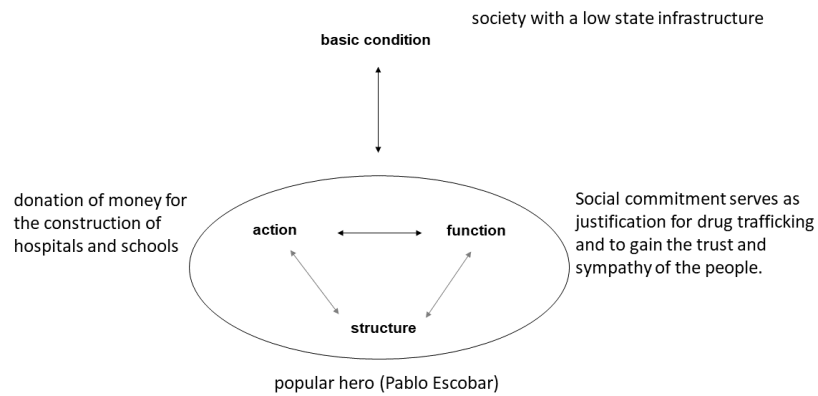
Figure 14 Pablo Escobar popular hero
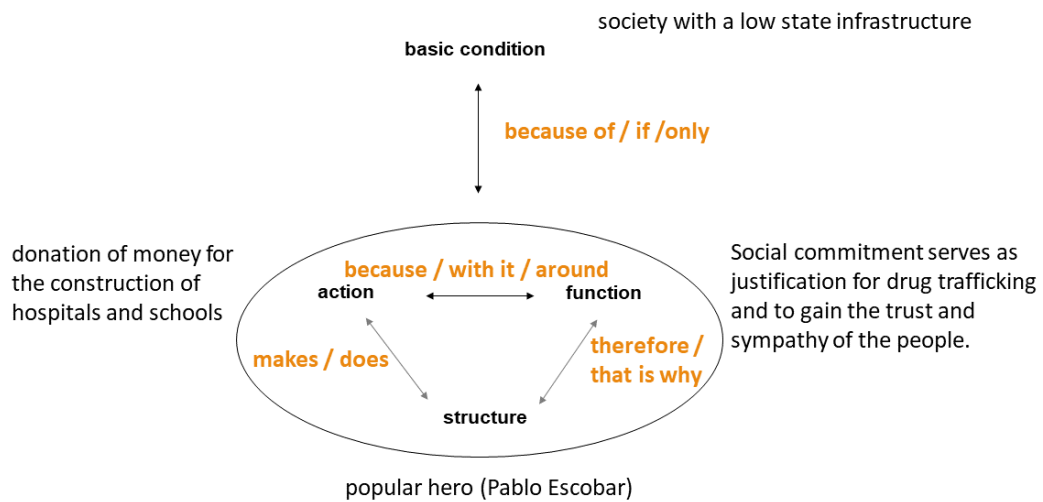
Figure 15 Pablo Escobar, popular hero - Memory Aid

As a **popular hero**, Pablo Escobar donated money to schools and hospitals. This social commitment served to justify the drug trade and to gain the trust and sympathy of the people.

The precondition for Pablo Escobar to appear as a popular hero is a society with low state infrastructure.

Explanation of the universal schema
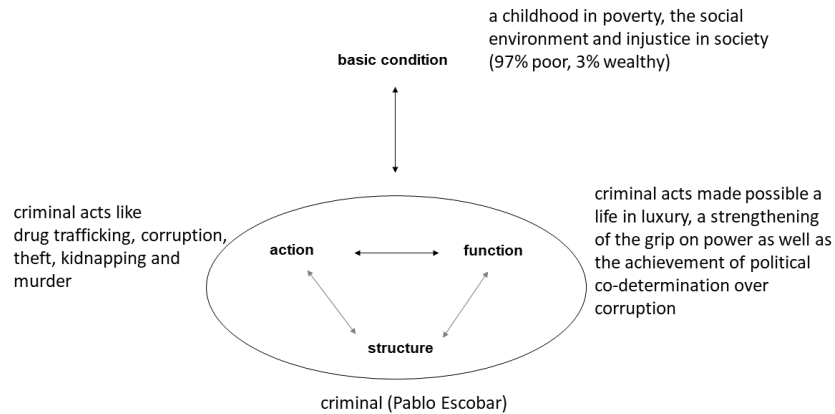
Figure 16 Criminal Pablo Escorbar
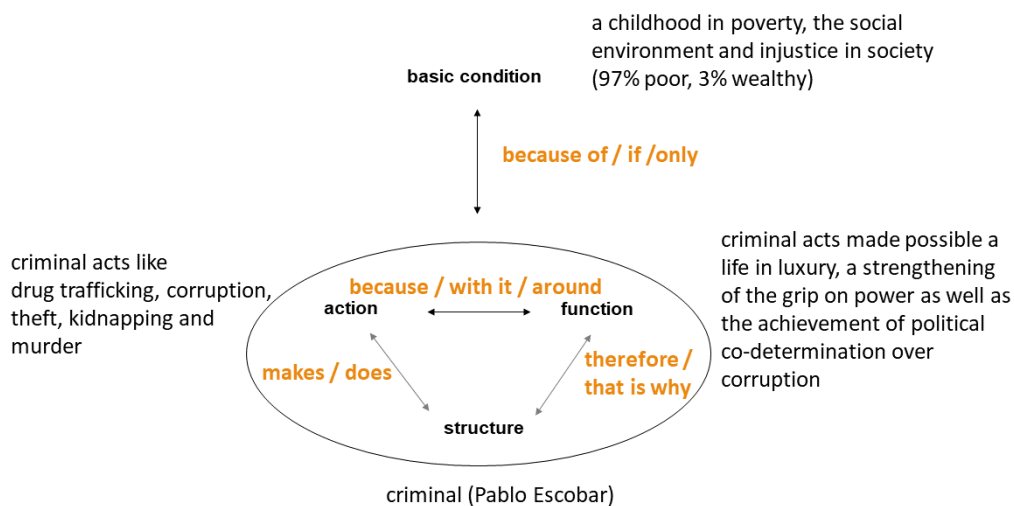
Figure 17 Criminal Pablo Escobar - Memory Aid

As a **criminal**, Pablo Escobar committed criminal acts such as drug trafficking, corruption, theft, kidnapping, and murder.

These criminal actions enabled Pablo Escobar to live in luxury, consolidate his power, and achieve political influence through corruption.

The conditions that, according to the students, made Pablo Escobar a criminal, are a childhood in poverty, the social environment, and the injustice in society.

Application example - future as actions

The statement „Future as action" shows how an abstract idea can be concretized with the help of the Universal Schema. Some excerpts from this statement are presented here. The entire statement is linked as a PDF file at the end of the text.

Explanation of the universal schema

Time
The mode of time is the past, the present and the future. The past is factual, the present is reality, and the future is possible.

basic condition

because the future consists of an overlay of changing possibilities.
The possibilities that can be created by an action "future" are: Speculations, assumptions, guesses about possibilities that may or may not occur.

The **future** as an action is the course of an open undecided or unresolved event in a concrete situation.

action ↔ **function**

structure

The progression of time

Figure 18 Future as actions

Time
The mode of time is the past, the present and the future. The past is factual, the present is reality, and the future is possible.

basic condition

because of / if /only

because the future consists of an overlay of changing possibilities.
The possibilities that can be created by an action "future" are: Speculations, assumptions, guesses about possibilities that may or may not occur.

The **future** as an action is the course of an open undecided or unresolved event in a concrete situation.

because / with it / around
action ↔ **function**

makes / does

therefore / that is why

structure

The progression of time

Figure 19 Future as actions - Memory Aid

If the term „future" is assigned to the action, the following questions can be asked: What structure does the „future" create and what function is triggered by „future"?

What basic conditions shape an interrelation whose actions are assigned the „future"?

A action can be represented as the sequence of an event in a concrete situation or can be formulated abstractly.

The „future" as a action is the sequence of an open, undecided, or unresolved event in a concrete situation.

The structure that creates the „future" is the progression of time. The progression of time can be interpreted in different ways, e.g. qualitatively as a description of a sequence of levels and crises or quantitatively as a calculable phenomenon.
The function explains why an action happens.
The action „future" therefore happens because the future consists of a superposition of changing possibilities.

Actions create possibilities and facts, which are called in the function.
The possibilities that can be created by an action „Future" are:
Speculations, assumptions, suppositions about possibilities that may or may not materialise.
The basic condition that shapes the interrelation of function, structure and the action „future" is time.

The modes of time are the past, the present and the future. The past is factual, the present is reality, and the future is possible.

Statement: Future as actions

Application example - self-reflection

The Universal Schema can also be used for self-reflection. I can use the Universal Schema to represent and explain myself for the purpose of self-reflection. In a self-reflection, for example, I can assign myself to the aspect of structure or the aspect of basic conditions.

What basic conditions influence my life?
For example: my biography (family background, school and education), partnership and family, circle of friends, professional situation.

basic condition

Why do I perform certain actions over and over again? What possibilities arise from my actions?

Which of my actions have a positive effect on me, which of my actions have a negative effect on me?

action — function

structure

I

Figure 20 I - assigned to the structure

What basic conditions influence my life?
For example: my biography (family background, school and education), partnership and family, circle of friends, professional situation.

basic condition

because of / if /only

Why do I perform certain actions over and over again? What possibilities arise from my actions?

Which of my actions have a positive effect on me, which of my actions have a negative effect on me?

because / with it / around
action — function

makes / does

therefore / that is why

structure

I

Figure 21 I - assigned to the structure - Memory Aid

If I assign myself to the aspect of structure, then I can ask myself the question: Which framework conditions influence my life?

For example, my biography, my partnership and family, my circle of friends or my professional situation.

Which of my actions influence me positively, which of my actions influence me negatively?

Why do I repeat actions that are not good for me? What opportunities arise from my actions?
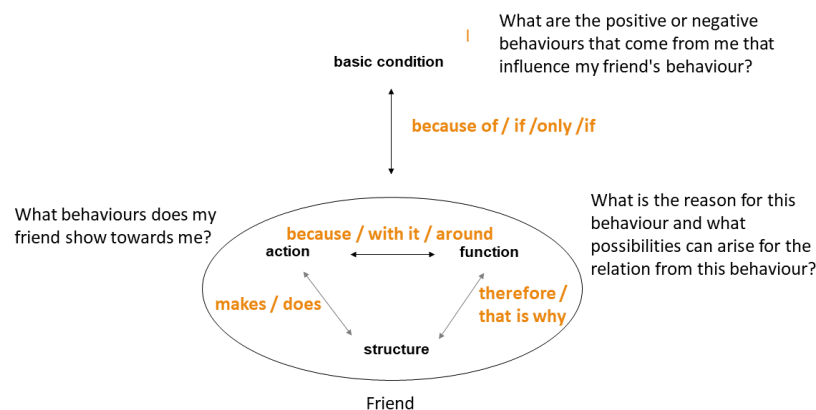
Figure 22 Me - assigned to the basic condition
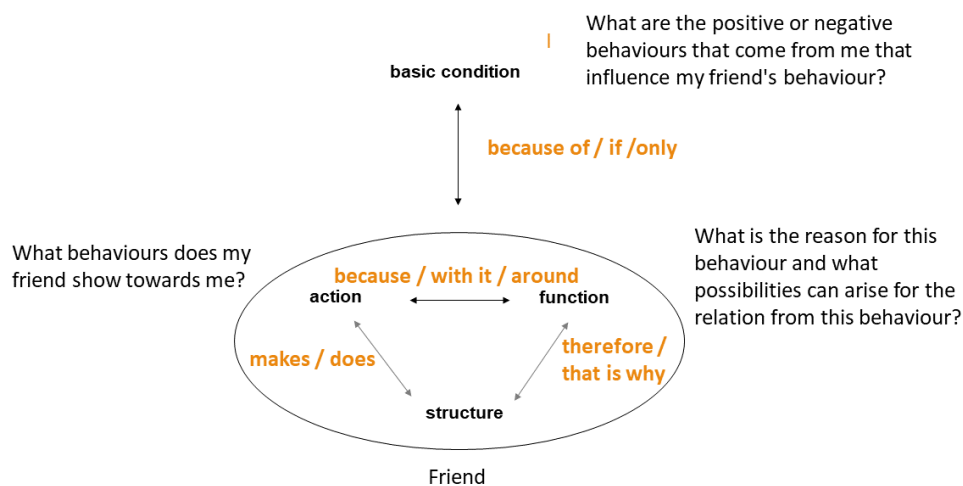
Figure 23 Me - assigned to the basic condition - Memory Aid

If I assign myself to the general conditions aspect and someone close to me to the structure aspect, the following questions may arise:

How does this person behave towards me? What are the reasons for this behaviour? What opportunities arise from this behaviour for our relationship?

What positive or negative behaviours emanate from me and influence the behaviour of someone close to me?

Definition of the aspects of the Universal Schema

Structures
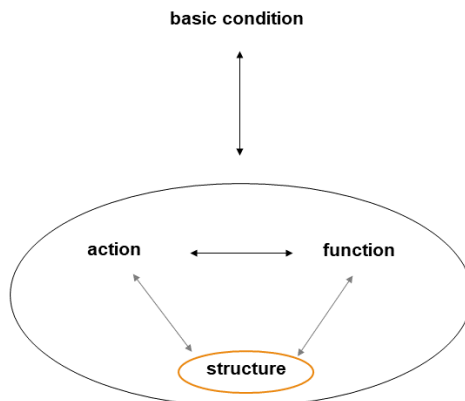
Figure 24 Definition of structure

Structures generate actions that trigger functions. Structures are forms of appearance that generate actions. Structures have a meaning that we experience through the actions that are generated by structures. Structures can be material or immaterial. Material structures can be material, tangible, objective or physically tangible.
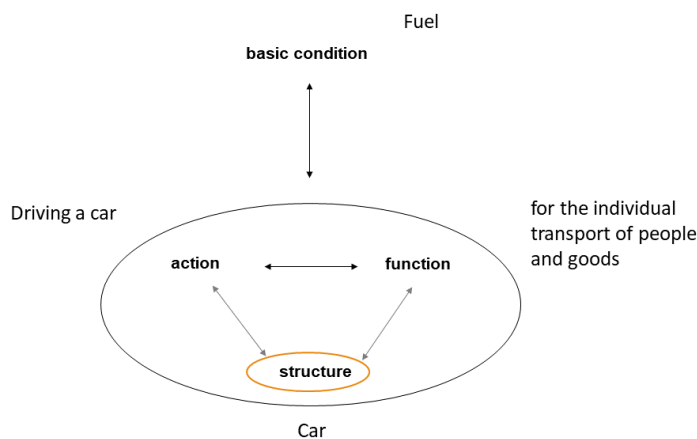
Figure 25 Example of a material structure

For example, a car is a material structure.

We can drive a car to transport people and objects individually from one place to another. The car needs fuel to be able to drive.
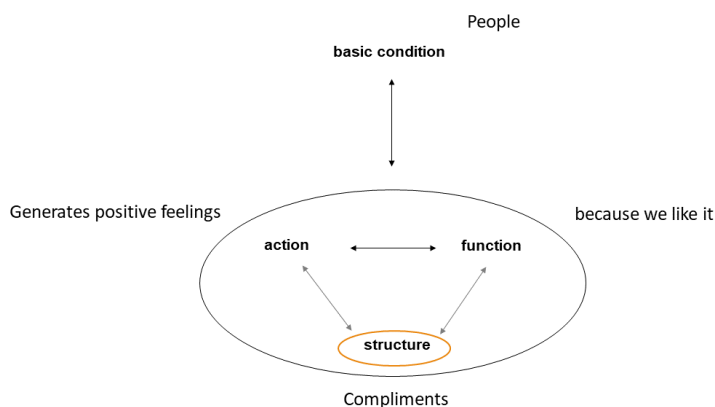
Figure 26 Example of an intangible structure

Immaterial structures are intangible, incorporeal, and of a spiritual nature. Immaterial structures can be fleeting, like a casually spoken sentence.

A compliment can generate positive feelings because we like it.

Actions
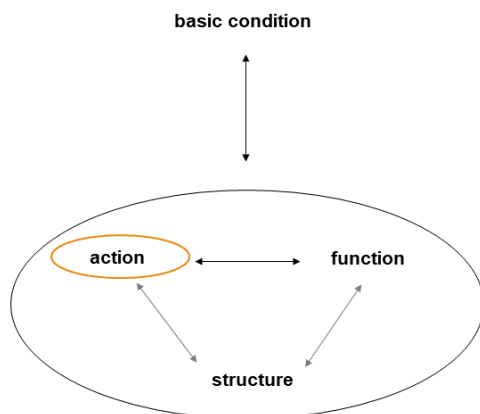
Figure 27 Definition of actions

Actions are generated by structures and trigger functions. Actions are assigned to finite periods of time in which something happens. This means that actions are limited in time. Actions begin at a certain point in time and end at a certain point in time.

Living beings and objects have their own periods of existence, which we colloquially refer to as ages. An existence period is a period of time in which a living being or object exists and changes.

Actions can be formulated abstractly or represented as a sequence of an event in a concrete situation. A sequence is the order of what happens in a period of time. For example, the planning of the action „teaching" can be outlined in abstract terms. After the lesson is finished, what actually happened in the lesson, i.e. in concrete terms, can be reported.

Functions
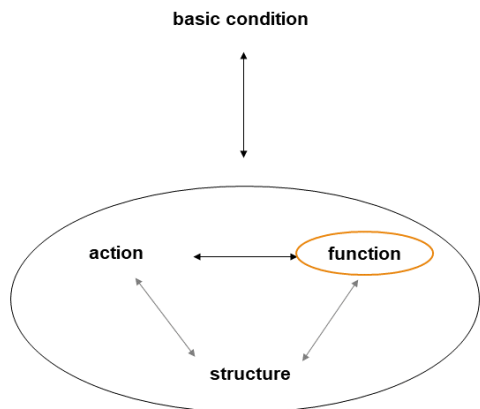
Figure 28 Definition of function

Functions are triggered by actions generated by structures.

Functions explain why an action happens and show the possibilities and facts that are created by an action.

A possibility is a two-valued statement about an event that can either occur, i.e. is true, or cannot occur, i.e. is false.

For example, when playing the lottery, various possibilities can occur.
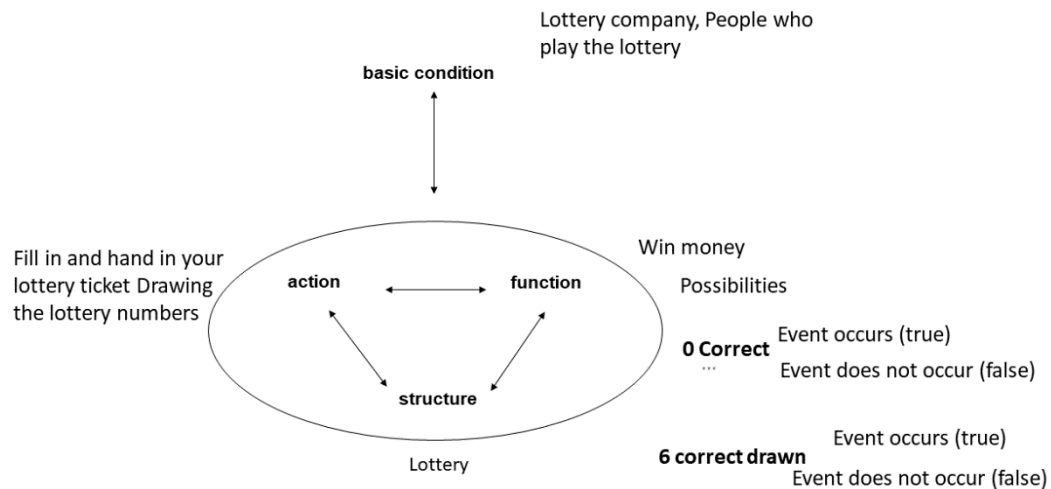
Figure 29 Example of options - Lotto

One possibility that can occur is that none of the numbers I ticked on the lottery ticket are drawn.
Another possibility is that all six numbers I ticked on the lottery ticket are drawn.
The future is determined by various overlapping possibilities.
This means that different possibilities can occur simultaneously in a situation that has not yet been decided.

The example of playing the lottery shows: As long as the lottery numbers for the current round have not yet been drawn, there are eight different possibilities that can occur simultaneously.

1. no number ticked on the lottery ticket is drawn.
2. one number ticked on the lottery ticket is drawn.
3. two numbers ticked on the ticket are drawn.
4. three numbers ticked on the ticket are drawn.
5. four numbers ticked on the ticket are drawn.
6. five numbers ticked on the ticket are drawn.
7. six numbers ticked on the ticket are drawn.
8. indeterminate possibility. For example, the lottery machine may break down during the drawing of the lottery numbers.

The moment the future becomes the present, the superimposition of possibilities comes to an end. The situation in which different possibilities can occur simultaneously has been decided.

In the present, it becomes clear which possibility or possibilities have actually materialised, i.e. are true. One or more possibilities have become facts.

The moment the drawing of the lottery numbers has ended, and the result has been determined, the superimposition of the eight possibilities of the current lottery round is also ended.
The repeated realization of possibilities into facts is the prerequisite for calculating probabilities to create forecasts.

Probability forecasts can be created for the various possibilities that occur when playing the lottery: For example, the probability of having ticked six correct numbers on the lottery ticket is 0.000006%. The probability of having five correct numbers ticked on the lottery ticket is 0.001660%.

Facts are possibilities that have occurred, i.e. have become true. Facts create choices. Once I have marked the six numbers on the lottery ticket that were drawn when the lottery numbers were drawn, I have various options for spending the money that I have won. For example, I can purchase property or speculate with part of the money or donate a share.

Basic conditions
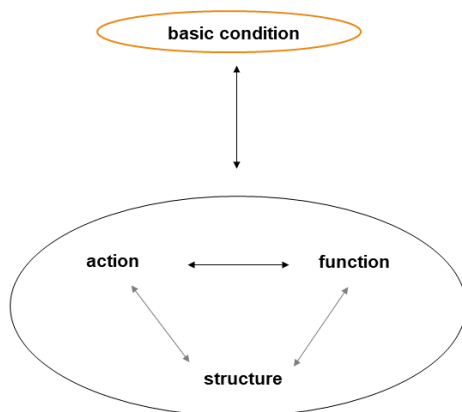
Figure 30 Definition of basic conditions

Basic conditions are segments that are the prerequisite for creating a connection between structure, action and function.
An intact ecological niche is the prerequisite for the survival of an animal species.

How the Universal Schema works

The Universal Schema is based on four hypotheses.

Structure-action hypothesis
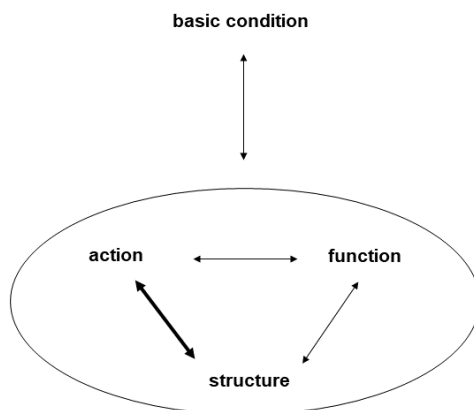
Figure 31 Structure-action hypothesis

The structure-action hypothesis suggests that a structure creates an action and that the performance of an action is dependent on this structure

Action-function hypothesis
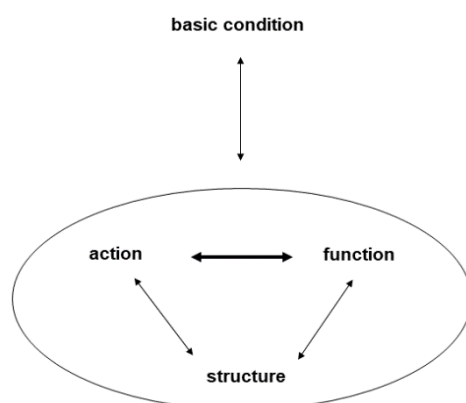
Figure 32 Action-function hypothesis

The action-function hypothesis states that an action triggers a function and that this function explains why the action happens. It shows the possibilities and facts that are created by this action.

Function-structure hypothesis
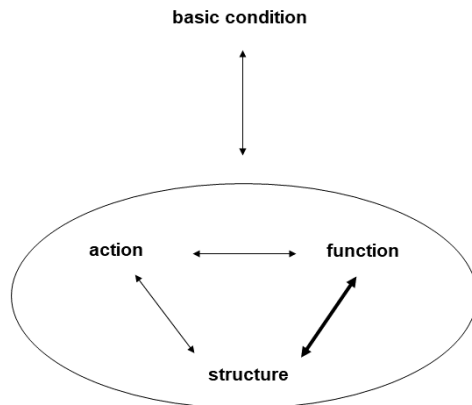
Figure 33 Function-structure hypothesis

The function-structure hypothesis suggests that the meaning of a structure is based on the explanation of why a action occurs. It also suggests that the meaning of a structure is tied to the function.

Basic condition - interrelation hypothesis
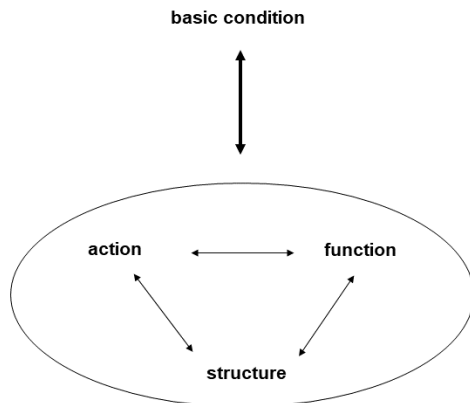
Figure 34 Basic condition - interrelation hypothesis

The basic condition - interrelation hypothesis suggests that the basic conditions and the interrelation between structure, action and function are mutually dependent.

Assignment of segments to the aspects of the Universal Schema

The assignment of segments to the aspects of the Universal Schema is not bound by rules and leads to the fact that we can assign a segment that we have segmented from a unit to all aspects of the Universal Schema.
This gives us the opportunity to discuss a segment from different perspectives. The discussion is conducted on the basis of questions that arise from the assignment of a segment to the aspects of the Universal Schema.

For example, the living beings segment can be discussed as follows:

Allocation discussion: living being segment as a structure

Explanation of the universal schema
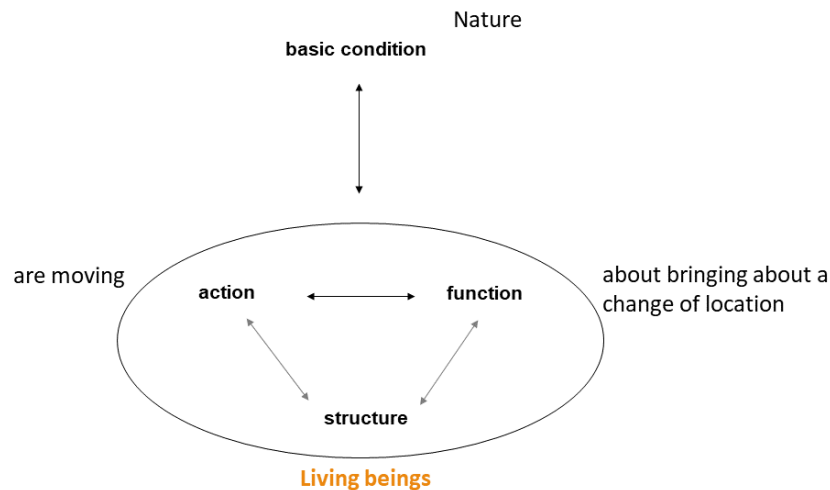
Figure 35 Discussion of „Living beings" structure

If the living being segment is assigned to the *structures* aspect, the following questions arise:

What actions are generated by a „living being" *structure* and what function does this action trigger? What basic conditions shape this interrelation?

Living beings move in order to bring about a change of location. The prerequisite for shaping this interrelation is nature.

Allocation discussion: living being segment as an action
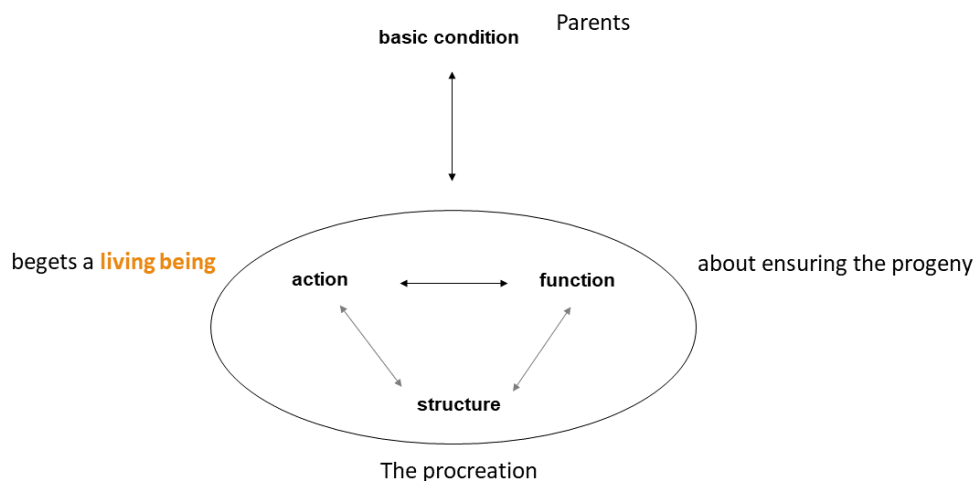
Figure 36 Discussion of actions „Living beings"

If the living being segment is assigned to the *action* aspect, the following questions arise:
What structure generates the *action* „begets a living being" and what function does this action trigger? What basic conditions shape this interrelation?

Reproduction produces a living being in order to ensure offspring. The prerequisite for shaping this interrelation are parents.

Allocation discussion: living being segment as a function

Reproduction of the parents

basic condition

merge

action ⟷ **function**

about begetting a **living being**

structure

Ovum and sperm cell
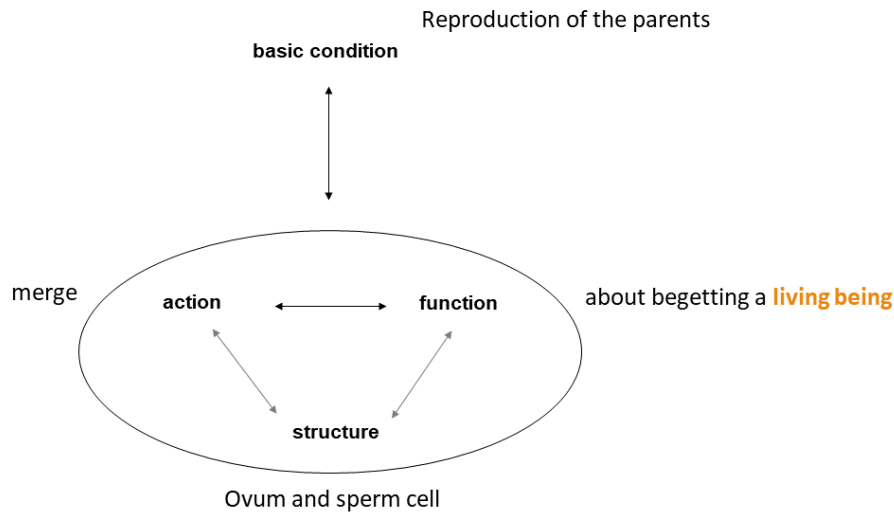
Figure 37 Discussion of the „Living being" function

If the living being segment is assigned to the *function* aspect, the following questions arise:
Which structure generates an action that triggers the *function* „to beget a living being"? What basic conditions shape this interrelation?

An egg cell and a sperm cell fuse to produce a living being. The reproduction of the parents is the prerequisite for shaping this interrelation.

Allocation discussion: living being segment as a basic condition

Tides, sun and moon, universe, climate, **living beings**

basic condition

creates different habitats

action ⟷ **function**

and thus creates a multitude of ecological niches, which leads to biodiversity on our planet.

structure

The nature
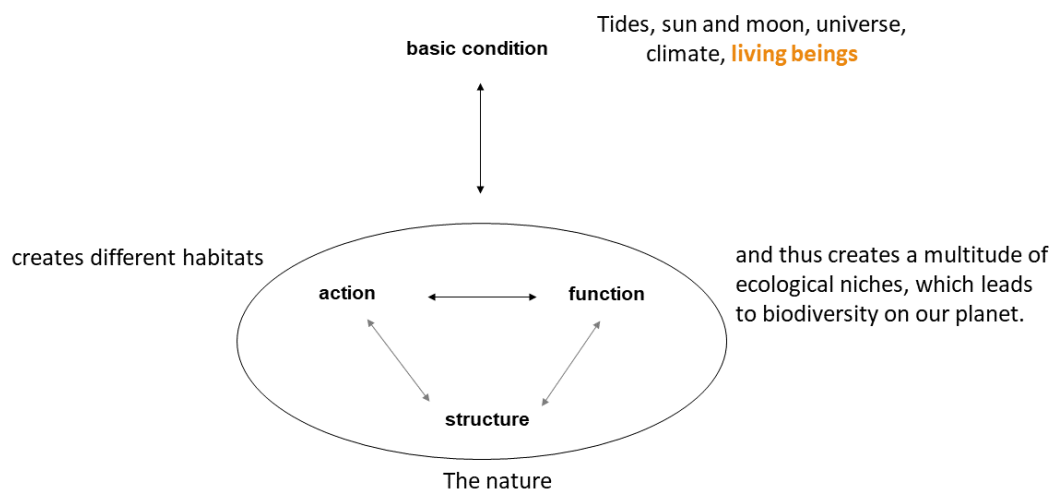
Figure 38 Discussion of basic condition „Living beings"

If the living being segment is assigned to the *basic condition* aspect, the following questions arise:

What relationship between structure, action and function does the *basic condition* „living beings" create?

Nature produces different habitats and thus creates a variety of special living environments, which leads to a diversity of species on our planet Earth. The tides, sun and moon, the universe, the climate and living beings are a prerequisite for shaping this context.

Ideologies, morals and religions

Ideologies, Morals and religions each convey their own specific and distinctive values and in this way create difference.
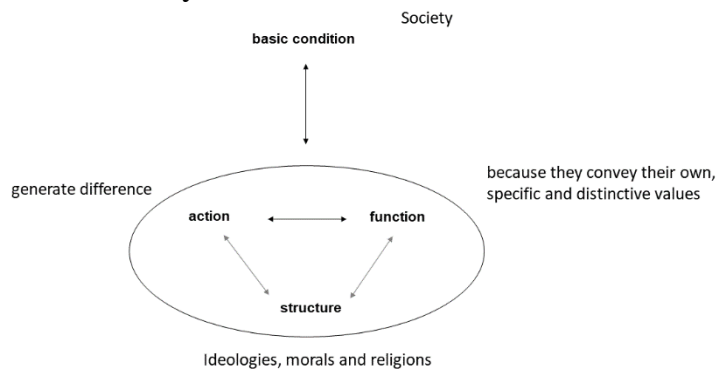
Figure 39 Ideologies, morals and religions

The Universal Schema does not convey any values and does not create any difference.
Therefore, the Universal Schema has no ideological, moral or religious significance and therefore cannot be instrumentalised for political or other purposes.
With the help of the Universal Schemas, different perspectives and differences between different ideologies, moral concepts and religions can be presented and explained.

Development phases of the Universal Schema

The theoretical development phase of the Universal Schema is now complete.
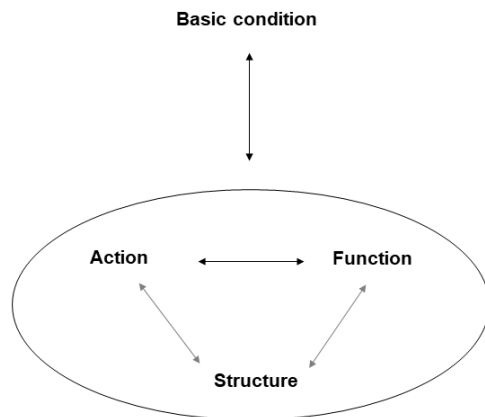
Figure 40 Universal Schema

The essential terms of the Universal Schema have been defined and the structure of the Universal Schemas has been realistically explained. The function and rules for the application of the Universal Schema have been discussed.

The Universal Schema has been explained rationally and without contradiction in its entirety and is ready for use. The test phase of the Universal Schema can now begin.

In order to be able to assess the application possibilities and quality the Universal Schema, we need experience. Only when we have gained experience with the Universal Schema can we say how the Universal Schema will prove itself in practice. Experience with the Universal Schema is the prerequisite for making predictions about the Universal Schema.

Further developing the Universal Schema as a communityproject

The testing and exchange of experience on the possible applications of the Universal Schemas is a joint task in which everyone can participate.

Now the Universal Schema is becoming a joint project that gives us the opportunity to try something new together.

For example, questions on the possibilities of applying the Universal Schema in different areas can be discussed:

Universal Schema and Society
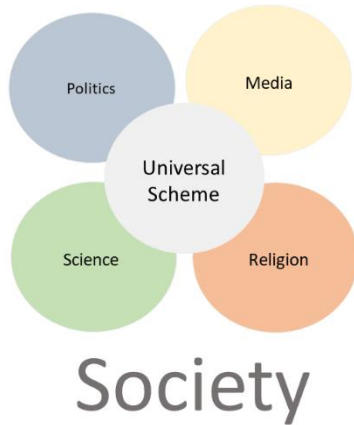
Figure 41 Universal Schema and Society

How can the Universal Schema be introduced into the social debate?
What happens if we use the Universal Schema for the cross-system and cross-domain exchange of information?
Do we understand phenomena better and can we shape Processes better if we use the Universal Schema as a minimal but comprehensive thinking model to describe and explain phenomena and a Processes?

Universal Schema and Organisations

Figure 42 Universal Schema and Organisations

What effects can the use of the Universal Schemas have as a cross-hierarchical thinking and communication concept in organisations?
Can the Universal Schema help to shape the exchange of information within organisations more efficiently?
How can the Universal Schema be implemented as a communication tool in organisations?

Universal Schema and Science
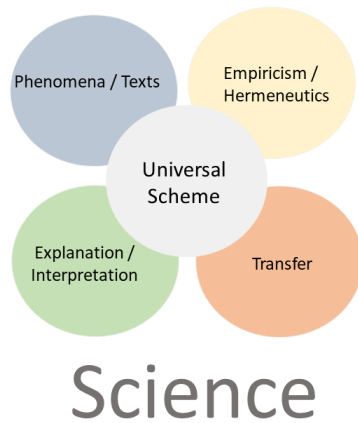
Figure 43 Universal Schema and science

How can Universal Schema be used in science and research?

Can the Universal Schema be used in hermeneutics as an analysis tool for the interpretation and understanding of texts?

Can the Universal Schema be used as a tool in empirical research?

What is the significance of the explanations of phenomena that we obtain with the Universal Schema?

What effects does the use of a universal thinking model have on *disciplinary scientific discourse*?

What is the transfer value of schematically uniform information in *interdisciplinary discourse*?

Universal Schema and climate change
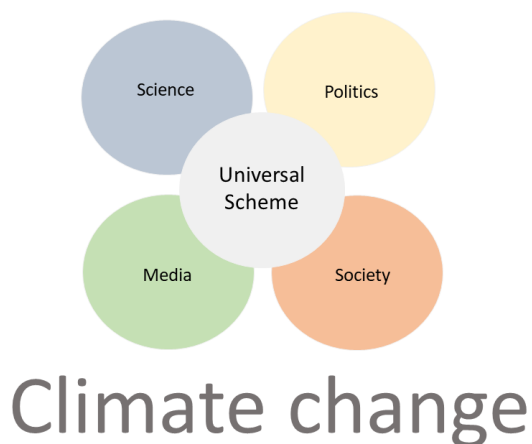
Figure 44 Universal Schema and climate change

Climate change is a global phenomenon with regionally varying effects.

By using the Universal Schema, the climate change-influencing phenomena and the regional effects of climate change can be presented and explained in a standardised form.

Does the global application of the Universal Schema lead to a better understanding of the Processes that influence climate change and thus to a greater acceptance of measures that are necessary as a result of climate change?

Universal Schema and Didactics

Figure 45 Universal Schema and didactics
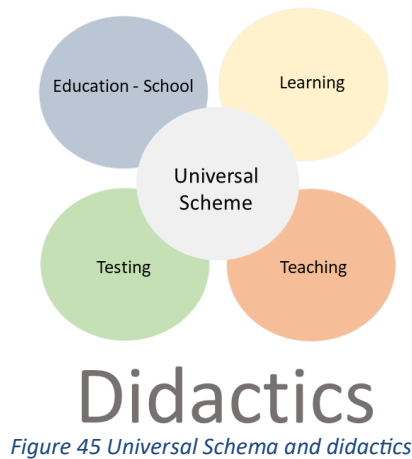
Does the Universal Schema require its own didactic method in order to convey and test knowledge?

What significance does Universal Schema have for intuitive knowledge actioning in order to generate a knowledge interrelationship without conscious reflection or logical reasoning?

How effective is the Universal Schema as a memory method, e.g. when using mnemonics or visual memory aids?

Conclusion

We cannot create and find truth with the Universal Schema. We create and find Clarity with the Universal Schema.

The Linking of Quantum Theory with the Universal Schema

Quantum theory

The starting point for linking quantum theory with the Universal Schema is the characterization of quantum theory as a theory for probability forecasts for arbitrarily decidable alternatives based on the Copenhagen interpretation of quantum theory, interpreted by Carl Friedrich von Weizsäcker.

„We now assume the Copenhagen interpretation as the „minimal semantics" of quantum theory. It indicates the minimum we know. In it, quantum theory is a theory of human knowledge about objects in time. We know objects (e.g. particles). We can experimentally measure the state parameters of these objects (e.g. position or momentum, angular momentum or energy). We predict the results of such measurements with probability; this is a reference to the future, i.e. to time." (Weizsäcker 1991, 133)

„Quantum theory, formulated completely generally, i.e. abstractly, makes no assumptions whatsoever that its objects must be bodies in space. It is a theory of probability predictions for any decidable alternatives." (Weizsäcker 1991, 97)

Arbitrary decidable alternatives can be actual, i.e. clearly defined possibilities that arise from a situation, a system or from the properties of an object.

Actual possibilities are separable alternatives, each of which appears as one alternative. (cf. Weizsäcker 2002, 388)

Actual possibilities are described quantitatively by specifying probabilities for formally possible events, with a clearly determined probability that is not equal to zero. (ibid.).

For example, in playing the lottery, there may be different possibilities, i.e. separable alternatives, each of which appears as an alternative
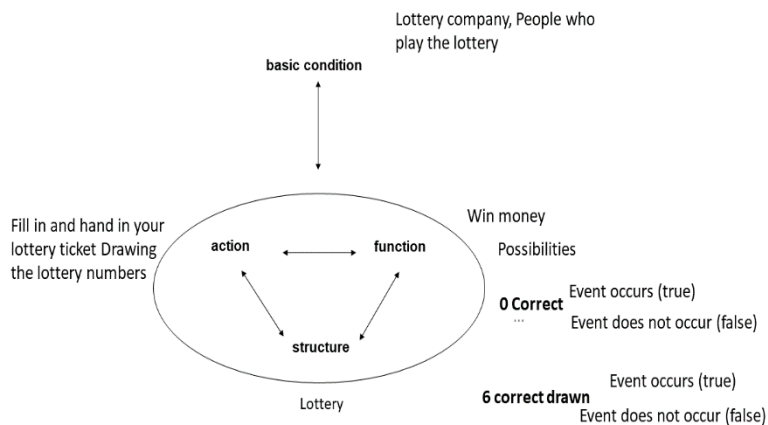
Figure 46 Example lottery

The probability / odds of the 6 numbers out of 49 that I have marked on my lottery ticket being drawn in the lottery are 1 in 13,983,816 → (≈ 0.000007%).

The probability / odds of the 5 numbers out of 49 that I have marked on my lottery ticket being drawn in the lottery are 1 in 54,201 → (≈ 0.001845%).

Figure 47 Carl Friedrich von Weizsäcker

The basis for linking the quantum theory with the Universal Schema is the *definition of the empirically decidable alternative* formulated in abstract quantum theory. The general laws of quantum theory are referred to as abstract quantum theory because they apply universally to all objects. (cf. Weizsäcker 2002, 34)

The concrete quantum theory is the theory of real existing objects. Space, particles and interaction are the basis of concrete quantum theory (cf. Weizsäcker 2002, 379).

„I now build, as I did in the book „Aufbau der Physik" chapter 8, quantum theory as a theory about empirically decidable alternatives, and then one can show mathematically that their psi-functions are described as vectors in a complex vector space and that all these vectors can be built up from complex two-dimensional vectors, that is, probability amplitudes for pure yes/no decisions, which I then call primal alternatives." (Transcript: Weizsäcker 2000, Chapter 3 Physics Min. 9:55 - 10:31)

The definition of the empirically decidable alternative can be represented schematically in the function of the Universal Schemas. Functions explain why an action happens and show the possibilities and facts that are created by an action. A possibility is a two-valued statement about an event that can either occur and is therefore true, or cannot occur and is then false.

Definition of the empirically decidable alternative. An n-fold alternative is a set of

$$n \left\{ \begin{array}{l} \text{Statements} \\ \text{State} \end{array} \right\} \text{of which exactly} \left\{ \begin{array}{l} a \\ \text{one} \end{array} \right\} \text{than} \left\{ \begin{array}{l} \text{true} \\ \text{presently} \end{array} \right\} \text{will prove,}$$

if an empirical test is carried out. (cf. Weizsäcker 2002, p.344)

An n-fold alternative is a set of n statements, exactly one of which will prove to be true in an empirical test.
An n-fold alternative is a set of n states, exactly one of which will prove to be true in an empirical test.
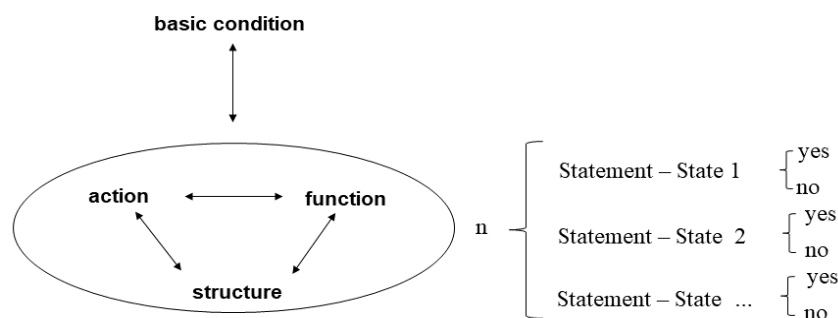
Figure 48 Schematic representation of the definition of empirically decidable alternatives

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Schrödinger's cat

„The best-known thought experiment on quantum mechanics was conducted by Erwin Schrödinger (1935). [...] With his thought experiment, Schrödinger wanted to show the seemingly paradoxical consequences that arise when a microscopic and a macroscopic object are in an entangled state." (Timm 2020,186)

The Schrödinger's cat thought experiment

One can even set up quite ridiculous cases. A cat is locked up in a steel chamber, along with the following device (which must be secured against direct interference by the cat): in a Geiger counter, there is a tiny bit of radioactive substance, so small, that perhaps in the course of an hour only one of the atoms decays, but also, with equal probability, perhaps none; if it happens, the counter tube discharges and through a relay releases a hammer that shatters a small flask of hydrocyanic acid. If one has left

this entire system to itself for an hour, one would say that the cat still lives if meanwhile no atom has decayed. The psi-function of the entire system would express this by having in it the living and dead cat (pardon the expression) mixed or smeared out in equal parts.

It is typical of these cases that an indeterminacy originally restricted to the atomic domain becomes transformed into macroscopic indeterminacy, which can then be resolved by direct observation. That prevents us from so naively accepting as valid a „blurred model" for representing reality. In itself, it would not embody anything unclear or contradictory. There is a difference between a shaky or out-of-focus photo and a snapshot of clouds and fog banks. (cf. Schrödinger 1935, 812)

There are different ways to structure the thought experiment Schrödinger's Cat with the Universal Schema.

Situation: the actual situation, i.e. clearly defined limited possibilities in the closed steel chamber. We do not know what will happen in the steel chamber. The situation is limited to one hour.

basic condition

We cannot observe the actions that take place in the steel chamber.

action ⟷ **function**

ψ function:

- One of the atoms decays or does not decay.
- The cat is either dead or alive.

structure

Figure 49 Illustration of the Schrödinger's cat thought experiment

The **basic conditions** are the actual, i.e. clearly defined, limited possibilities in the closed steel chamber. We do not know what happens in the steel chamber. This situation is limited to one hour.

The steel chamber in which the cat is located along with the „infernal machine" is assigned to the **structure**.

The **function** is a ψ-function (psi-function): „the ψ-function is the list of possible predictions." (Weizsäcker 2002, 542)

The elements of this list result from the formally possible properties of the objects that are in a certain state at a certain point in time (cf. Weizsäcker 2002, 335).

The objects can be assigned to the structure or the frame.
Two objects are assigned to the structure here: The radioactive substance and the cat.
The properties of these objects are: one of the atoms of the radioactive substance decays within an hour or does not decay. The cat is dead or alive.

A action is assigned to a finite period of time in which something happens. Since the steel chamber is closed, we cannot observe the actiones in the steel chamber.

Sources:
Picture credits
[Dhatfield - Own work, CC BY-SA 3.0,](#)
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Coincidence

A coincidence is a limited period of time in which something happens and therefore coincidence is a action. A coincidence happens in the present, which then passes into the past.

„The present, for which a present-tense statement applies, is then necessarily a, albeit brief, perhaps arbitrarily brief, span of time." (Weizsäcker 2002, 613)
„As present-tense statements, we want to designate those statements that denote a current fact or a current event." (Weizsäcker 2002, 64)

The temporal change of actual possibilities - i.e. the action of turning the future into the present - is the transition to new possibilities. (Cf. Weizsäcker 2002, 389)

There are two types of chance, subjective chance and objective chance.

Subjective coincidence

The coincidence that appears random to us, but is based on a causal regularity, was called subjective coincidence by Werner Heisenberg. Objectively considered, however, the subjective coincidence is not a coincidence in the true sense, because it follows a causal regularity. In principle, subjective coincidence can be described by natural laws if we can capture all the characteristics that produce a subjective coincidence. (Cf. Zeiliger 2005, Ch. Coincidence, Min.2:10) Then we can describe the coincidence causally, as the sequence of an event.

Objective coincidence

„However, quantum mechanical chance [i.e. objective chance] must not be equated with a lack of rules. Even if the individual measurement results cannot be predicted, the probabilities of their occurrence are strictly determined by the laws of quantum mechanics."(karambelll gepostet am Mai 5, 2011)

„Here, in quantum theory, is the only place in the mathematical natural sciences where an „objective" randomness can occur." (Görnitz 2002, 95)

Werner Heisenberg designated coincidence that cannot be described by a causal law as objective coincidence. The course of an objective coincidence cannot be reconstructed. What the quantum mechanical particle does is purely random, there is no hidden explanation for it. It is pure, irreducible. (cf. Zeiliger 2005, chapter on chance, min. 7:24)

„We will see that we still cannot explain chance in the quantum mechanical individual action, but we will at least gain an understanding of the fact that [objective] chance cannot be explained any further. In particular, we will now understand why, as a rule, there is no reason for the quantum mechanical individual result to take place as it does." (Zeilinger 2003, 221)

The structure, whose basic condition is a quantum mechanical single action, generates an action in the form of an objective coincidence that we cannot explain further. We can assign the properties of this structure as a list of possible predictions of the function.
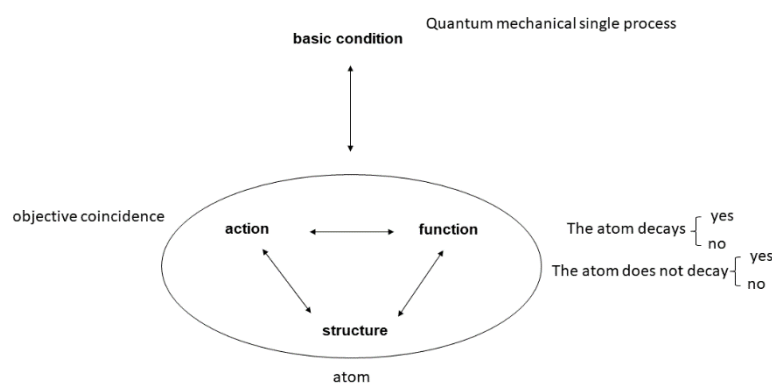
Figure 50 Illustration of quantum mechanical single action

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Schrödinger's cat: entanglement and superposition

Entanglement is not an interaction between objects, but at best a correlation, i.e. a cause-and-effect relationship. The image of a mutual influence creates an inappropriate and false idea of entanglement. (cf. Görnitz 2016, 471)

„Schrödinger wanted to use his thought experiment to demonstrate the seemingly paradoxical consequences that result when a microscopic and a macroscopic object are in an entangled state." (Timm 2020,186)

This means that the state of the macroscopic object cat, dead or alive, is causally related to the state of the microscopic object atom, decaying or non-decaying. When the atom decays, the cat dies. The state of the cat does not affect the state of the atom.

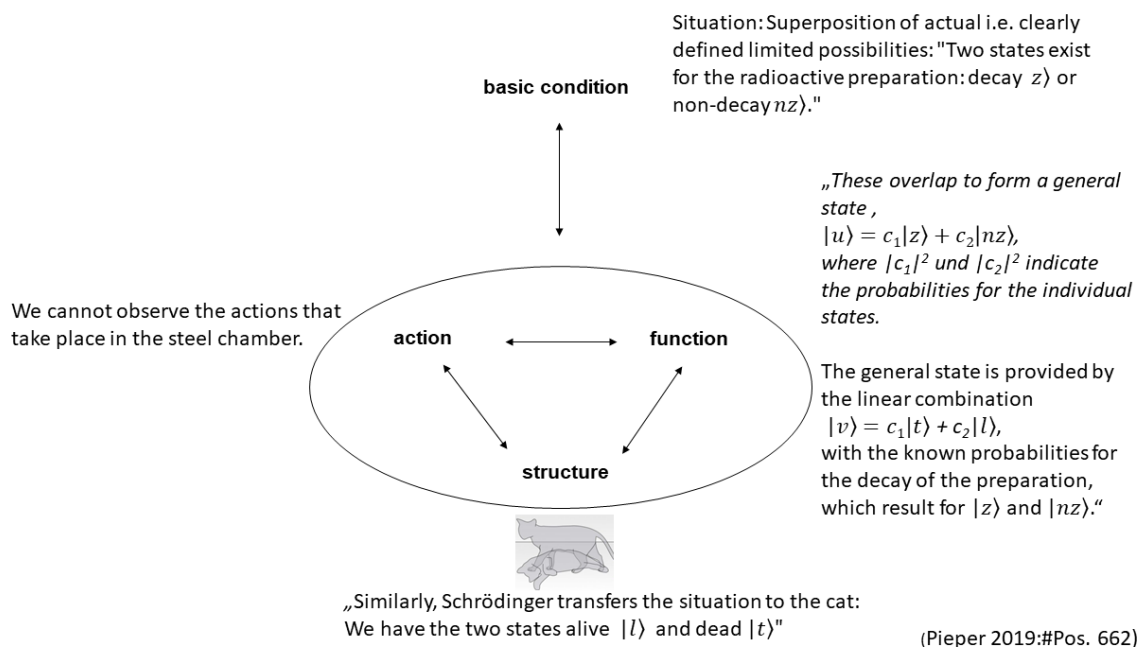Situation: Superposition of actual i.e. clearly defined limited possibilities: "Two states exist for the radioactive preparation: decay $z\rangle$ or non-decay $nz\rangle$."

basic condition

„These overlap to form a general state ,
$|u\rangle = c_1|z\rangle + c_2|nz\rangle,$
where $|c_1|^2$ und $|c_2|^2$ indicate the probabilities for the individual states.

We cannot observe the actions that take place in the steel chamber.

action ⟷ **function**

The general state is provided by the linear combination
$|v\rangle = c_1|t\rangle + c_2|l\rangle,$
with the known probabilities for the decay of the preparation, which result for $|z\rangle$ and $|nz\rangle$."

structure

„Similarly, Schrödinger transfers the situation to the cat: We have the two states alive $|l\rangle$ and dead $|t\rangle$"

(Pieper 2019:#Pos. 662)

Figure 51 Schrödinger's cat: entanglement and superposition

The entanglement of the objects „radioactive preparation" and „cat" can be represented in the following way: The object „radioactive preparation" is assigned to the basic condition and the object „cat" is assigned to the structure.
Because the steel chamber is closed, we cannot observe the action that happens in the steel chamber.

The ψ-function, or the list of possible predictions, is assigned to the function. This results from the properties of the microscopic object, the radioactive preparation, which can either decay $|z\rangle$ or not decay $|nz\rangle$ and which is assigned to the framework conditions, as well as the properties of the macroscopic object, the cat, which is either dead $|t\rangle$ or alive $|l\rangle$ and which is assigned to the structure. (cf. Piper 2009 #Pos. 662)

„the ψ-function is the list of possible predictions. A probability ½ for two alternative possibilities (here: „alive-dead") means, that the two incompatible situations must be considered equally possible for the time the prediction refers to." (Weizsäcker 2002, 542)

„Before observation, the macroscopic system in the box is therefore in a „superposition" of clearly different states - they contain a living or a dead cat." (Timm 2020, 187)

A superposition is the superimposition of different possible states of an object in a concrete but not yet decided situation. When describing a concrete but as yet undecided situation, statements are made about possible empirical findings that may result from this situation. In relation to the cat in the closed steel chamber, there are two possible empirical findings: The cat can either be dead or alive.

We cannot observe the development of the situation in the closed steel chamber, but we know that this situation is determined by two actual possibilities that are entangled.

The first possibility arises from the properties of the microscopic object, the radioactive substance, one of whose atoms can either decay or not decay.

The second possibility arises from the properties of the macroscopic object „cat". The cat in the steel chamber can either be dead or alive. This depends on whether an atom decays or not. This statement precisely describes the entanglement of the objects in the steel chamber. If the atom decays, *„the counting tube responds and activates a little hammer via a relay, which smashes a small piston with hydrocyanic acid."* (Schrödinger 1935, 812) and the cat dies. If the atom does not disintegrate, the cat remains alive.

The definitive state of the cat - dead or alive - is decided by objective quantum-theoretical chance, i.e. the decay or non-decay of an atom.

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Schrödinger's cat: Schematic representation of the Uralternatives

We call the binary alternative the uraltenative

„We call Uralternatives alternatives into which every empirically decidable alternative can be broken down."(Weizsäcker 2002, 398)

„The smallest alternative that still means a decision is the binary (twofold) alternative […]. The binary alternatives from which the state spaces of quantum theory can be constructed are called Uralternatives. We call the subject assigned to an Uralternative a Ur." (Weizsäcker 2002, 392)

"Their number [meaning the number of ures] *in a given object, a spatial region or a hypothetical finite universe would be the measure of the maximum definable information in this object, region or universe. The ures are the lowest quantum-theoretically possible semantic level [level of interpretation]."* (Weizsäcker 2002, 576)

The schematic representation of the Uralternatives, which form the quantum-theoretical state space of the Schrödinger's cat thought experiment, results from the properties of the microscopic object, an atom - Ur 1 - of the radioactive preparation, which either decays - Uralternative 1 - or does not decay - Uralternative 2 -, and the properties of the macroscopic object, the cat - Ur 2 -, which is either dead - Uralternative 3 - or alive - Uralternative 4 -.
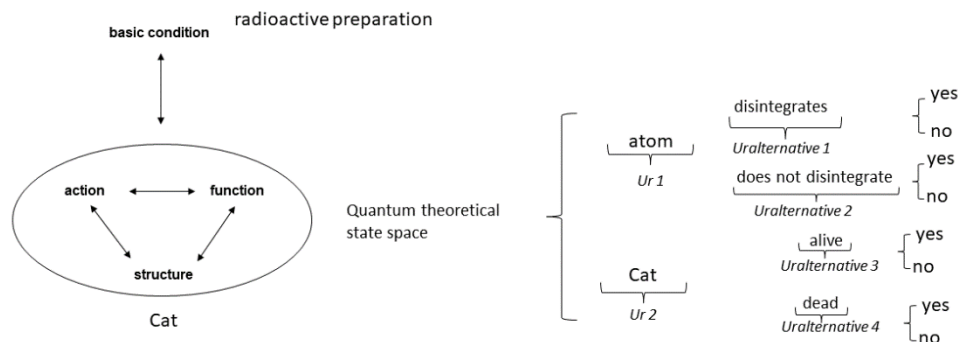

Figure 52 Schrödinger's cat: Schematic representation of the Uralternatives

The quantum-theoretical state space of the "Schrödinger's cat" thought experiment consists of two ures - atom and cat - and four Uralternatives:

1st Uralternative: The atom decays Yes – No.
2nd Uralternative: The atom does not decay Yes – No.
3rd Uralternative: The cat lives Yes – No.
4th Uralternative: The cat is dead Yes – No.

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Measurement

„Schrödinger intensifies the paradoxical impression by taking a living being as an example. The poor cat is treated here simply as a measuring instrument which, with its conspicuous and humanly moving contrast between the states of life and death, is intended to illustrate the irreversibility [irreversibility] of the measuring action." (Weizsäcker 2002, 542)
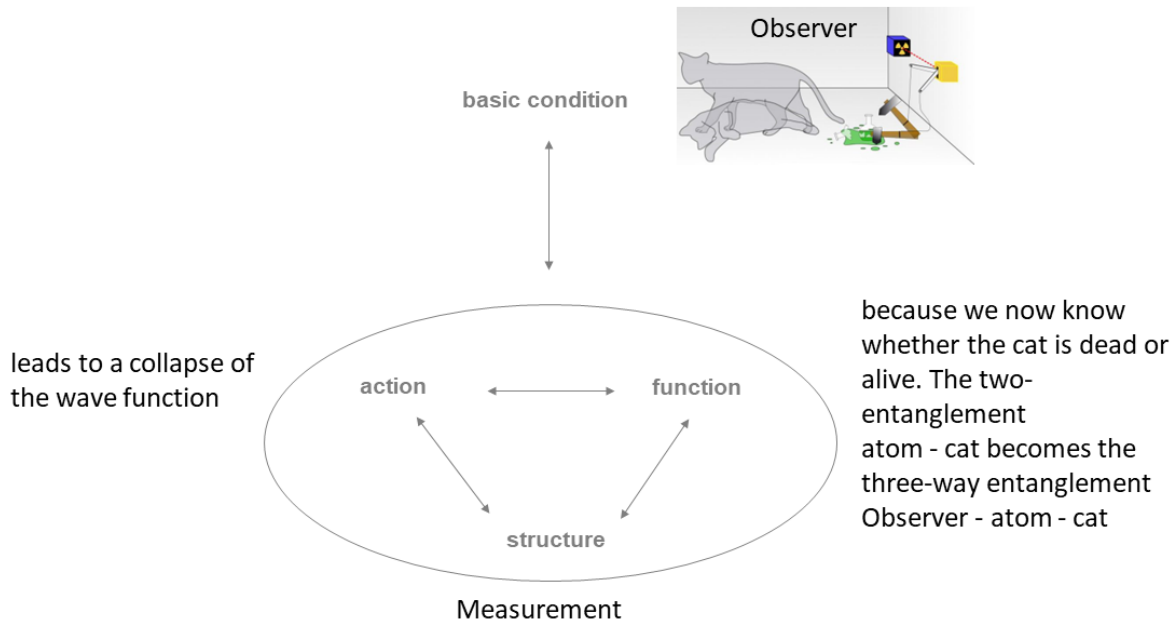
Explanation of the universal schema

Figure 53 Schrödinger's cat: measurement

Opening the steel chamber triggers a collapse of the wave function or the ψ-function, as we can now observe the state of the cat. Observing the state of the cat is the measuring action, because the cat is the measuring instrument.
We can now say whether the cat is dead or alive. If the cat is dead, then one of the atoms of the radioactive substance has decayed; if the cat is alive, then no atom of the radioactive substance has decayed.

„The interference-free measurement is an epistemological [epistemological] turn, ontologically [of being - i.e. of what is] the observer, measuring apparatus and atomic system are entwined." (Messer 2007, 20)

The moment when the observer opens the steel chamber can theoretically also be interpreted in such a way that the two-way entanglement of atom and cat becomes a three-way entanglement: observer, atom and cat.

The reason for the idea of a possible triple entanglement is the collapse of the wave function or ψ-function caused by the measurement, i.e. the list of elements of the possible predictions (cf. Weizsäcker 2002, 542).

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Observer

„When an observer opens the box, they find either a living or a dead cat. They never find a superposition of a living and dead cat (what would that even look like?). This is the motivation to postulate a state collapse: According to the projection postulate, the state collapses instantaneously [immediately] during measurements. In the present case, the observation of the cat's state is considered a measurement." (Timm 2020 ,187)

Superposition: The cat is in a superposition of two possible states: alive or dead.

basic condition

opens the steel chamber

action ←→ function

to determine the state of the cat. This resolves the superposition.
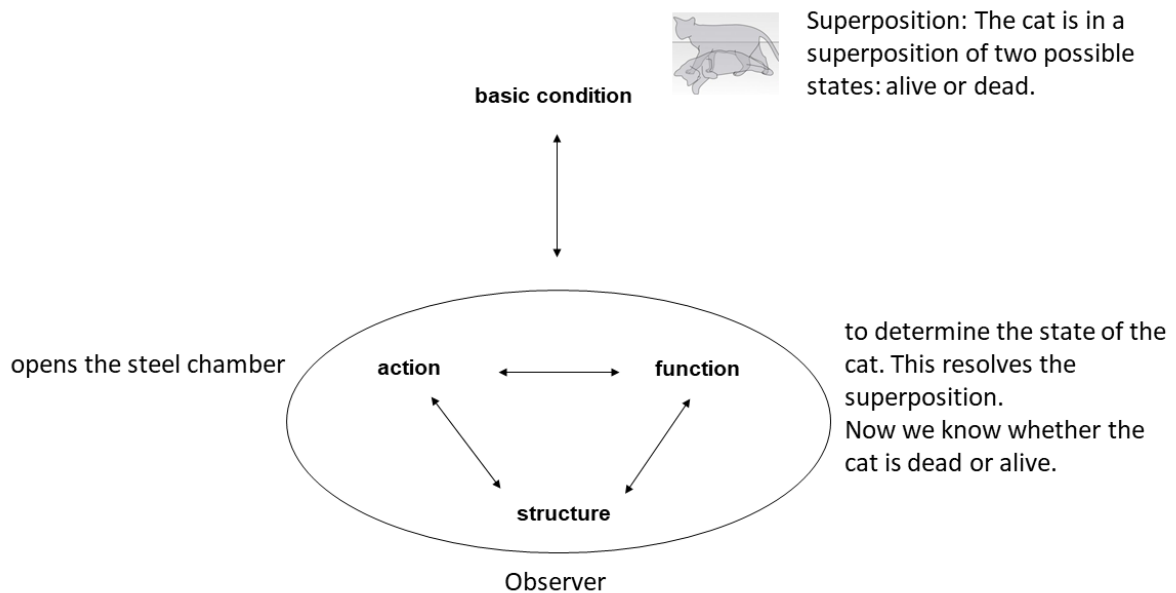Now we know whether the cat is dead or alive.

structure

Observer

Figure 54 Schrödinger's cat: observer

The observer, who is now connected to the structure, opens the steel chamber to determine the state of the cat. This resolves the superposition associated with the basic conditions.
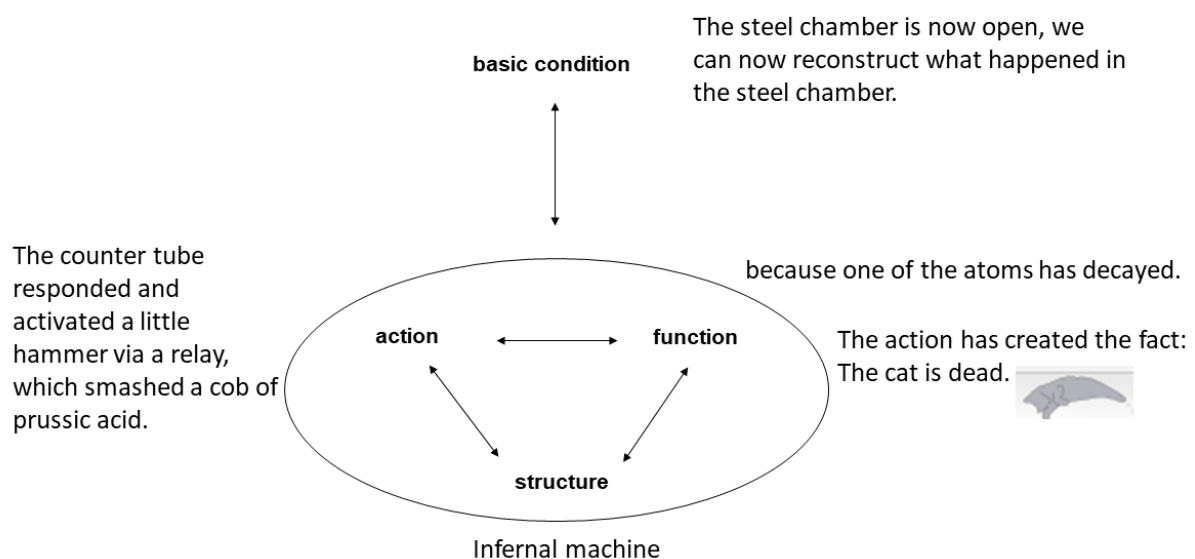
The steel chamber is now open, we can now reconstruct what happened in the steel chamber.

basic condition

The counter tube responded and activated a little hammer via a relay, which smashed a cob of prussic acid.

action ←→ function

because one of the atoms has decayed.

The action has created the fact: The cat is dead.

structure

Infernal machine

Figure 55 Schrödinger's cat: The steel chamber is open

The steel chamber is open and we see that the cat is dead. The infernal machine, assigned to the structure, has generated a subjectively random action that led to the cat's death. We can

reconstruct this action: The Geiger counter responded and activated a small hammer via a relay, which shattered a vial containing prussic acid. (cf. Schrödinger 1935, 812)

The action occurred because an atom decayed. The death of the cat is the fact that was created by the action. This is the description of the function that was triggered by the action. The function explains why the action happened and shows the possibilities and facts that are created by actiones.

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The applicational reference of quantum theory

The past does not require description through a ψ-function that continuously depends on time. As far as we know the past, it consists of facts that could in principle be enumerated separately (e.g., at time t0 from the results of … M-3, M-2, M-1). […]

On the other hand, the future is known to us only in the form of the probability catalogue, called the ψ-function, a catalogue whose validity extends exactly to the next measurement, […] There is only one necessary inference from quantum theory regarding the past. Every now past fact was once a possible future event; its probability could then be determined by a ψ. (cf. Weizsäcker 2002, 518)

Quantum theory, as a theory for probability predictions for arbitrarily decidable alternatives, loses its significance when the transition from the future to the present occurs; when a measurement takes place.

„The phenomenal present is neither a point in time nor a period of time, but is not measured on a scale." (Weizsäcker 2002, 386) The phenomenal present consists of clearly defined possibilities.

The present is the Reality. Reality are the possibilities that are realised. If possibility B is realised from the possibilities A, B, C, then this possibility has become reality. The present can be seen as a link between the future and the past; it is the moment of decision and change. (cf. Hollitzer 2011, 27-28)

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