(This is a part of the book The Concept of Reality.pdf)

Contents:

4. The modified Picture of Reality

4.1. Preliminary Note

Reality, as it is presented in this work, appears *deterministic*: everywhere and anytime the fundamental law is in effect.

But at the same time *free will* exists.

According to conventional conviction, these two facts contradict each other. [1]

The arguments, through which this contradiction is eliminated, have been presented in the previous section. Since there, however, they served for the building-up of the specific train of thought that was required at this point – such that they appeared only implicitly –, I will present them now again, but this time more general, more detailed and explicitly related to the contradiction.

Moreover, I will discuss the consequences that these very arguments have for the understanding of reality.

In order to keep the argumentation on free will independent from my own physical and ontological hypotheses, I've avoided drawing on them in the previous considerations. As long as possible, I will continue to act in this way.

Finally, however, it will be necessary to resort to my assumptions, because without them the picture remains incomplete.

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[1] Some philosophers think, however, that this contradiction is a pseudo-problem, which arises only because of the improper confrontation of the subjective and the objective-analytic point of view. Already at the beginning of chapter *2. Mind and Matter*, I have stated that such a simple separation of the two views cannot be maintained in the face of our increasing knowledge about neuronal networks. It is obvious that we ourselves are part of nature and that our mind must therefore be related to the scientific description of reality. The retreat to the claim of a fundamental separateness of the two views is not a serious position.

On the other hand, most scientists – also brain researchers – are convinced that the phenomenon *mind* can completely be explained by a scientific-technical description. Also this position, however, represents an inadmissible simplification: mental states are *qualia,* and as such they are not contained in any description of reality.

4.2. Free Will and Determinism

In 1814, Pierre Simon de Laplace formulated the deterministic view of reality in his *Essai philosophique sur les probabilités* as follows:

"Nous devons […] envisager l'état présent de l'univers comme l'effet de son état antérieur et comme la cause de celui qui va suivre. Une intelligence qui pour un instant donné connaîtrait toutes les forces dont la nature est animée et la situation respective des êtres qui la composent, si d'ailleurs elle était assez vaste pour soumettre ces données à l'analyse, embrasserait dans la même formule les mouvements des plus grands corps de l'univers et ceux du plus léger atome: rien ne serait incertain pour elle, et l'avenir, comme le passé, serait présent à ses yeux."

("We ought then to regard the present state of the universe as the effect of its anterior state and as the cause of the one which is to follow. Given for one instant an intelligence which could comprehend all the forces by which nature is animated and the respective situation of the beings who compose it – an intelligence sufficiently vast to submit these data to analysis – it would embrace in the same formula the movements of the greatest bodies of the universe and those of the lightest atom; for it, nothing would be uncertain and the future, as the past, would be present to its eyes.")[2]

This statement is currently regarded as twofold obsolete: first, due to quantum mechanics, and secondly, due to chaos dynamics. In the case of quantum mechanics – at least in the usual interpretation – it is the objective randomness of the events that makes a precise knowledge about the future impossible, in the case of chaos dynamics, it is the fact that arbitrarily small differences in the initial conditions can result in large differences in the development of a system.

Both corrections of Laplace's worldview are often used as arguments for the freedom of the will, in the sense that they would create room for freedom. But actually, they are irrelevant for the question of free will. In the case of quantum mechanics, for substantiating freedom would have to be assumed that the will itself appears as *hidden parameter,* which need not seriously be considered. In the case of chaos dynamics, the predictability is indeed limited, it may even be completely lost, but for the question of free will, this is irrelevant: If nature *is* an algorithmic system and obeys its law *with infinite precision*, then nothing is won through the appearance of chaos-dynamical instabilities. No room for freedom is created – regardless of whether the law is deterministic or probabilistic. The contradiction persists.

[2] archive.org/download/philosophicaless00lapliala/philosophicaless00lapliala.pdf. (Translated by Frederick Wilson Truscott and Frederick Lincoln Emory.)

However the argument that has been carried out in the previous chapter is not affected by the above considerations. This means that Laplace's statement must be wrong regardless of whether there is quantum mechanical objective randomness or not, i.e. it must be wrong in another respect.

Thus the question is: *What* is wrong in Laplace's statement?

By assuming that an intelligence of sufficient capacity would be able to derive the future from the present, Laplace postulates – I quote my formulation in 2.2 – that there is "an *algorithm,* that is: a procedure, which permits deriving and calculating future events from the present conditions through the application of defined rules."

But as stated at the beginning of the deduction of free will, already in the case of more than three moving bodies bound to each other by gravitation, it is impossible to specify an *exact* method, because ***such a method does not exist***.

In order to predict the future, however, the method *must* be exact. (Moreover, since nature itself is infinitely precise, only an exact method would be entitled to claim correspondence to the algorithm that nature itself performs.)

Of course one can set up differential equations and plug in initial conditions, but it is impossible to integrate these equations. However analytic integration is the only exact method, i. e. the only one that leads to correct values of variables at a future point in time. Otherwise, there are only approximations, whose results can be wrong in the next moment.

Therefore, without integration, one comes not beyond the present; determining the future fails.

Let us look at the function that represents the path of one of the bodies. Since the movement of each body depends on all other bodies, and because their positions and momentums are altered incessantly, from this function follows actually *nothing at all.* There is no possibility for any precise prediction of the future position of the body. And the same applies of course to all other bodies.

In the general case, ***there is no exact algorithm*** *that leads from the present to the future, and that means at the same time: there is no method that corresponds to that which nature itself uses to create the future.*

How is it then possible that the illusion that such an algorithm exists, could become so powerful? Are there any cases at all, in which it exists?

Yes, there are such, even if only as idealizations. It is the cases that lie so to speak at the maximum distance from the general case, namely those cases where not all objects move freely and random but where only *one single object* moves and *all other objects* (insofar they influence the body to be measured) are assumed as resting.

Exactly such idealized special cases, however, are the ones through which physical laws can be discovered and tested – and this applies from Galileo's simple pendulums and rolling balls up to the most complex measurements in modern particle accelerators. This is the reason why these laboratory experiments have become paradigms, and in this way the illusion could emerge that the future develops from the present in an algorithmic way

In short: The law can only turn into an algorithm, if *order* is presupposed.

In the general case, however – and this is the one where, except for the order which is already given by the law itself, no further order exists, i.e. in which the initial conditions are random – there is a law, but there is no algorithm.

Now I change over to my own physical system. Here, the just described situation is immediately recognizable. The law that generates reality is

$$\frac{d\sigma}{dr} = \pm \frac{1}{c^2} \frac{dv}{dt}$$

Thus, two differential quotients are related to each other.

One could say: *reality is woven in the infinite Small*, or: *the meshes of the fabric of reality are infinitely small.*

Here, it is obvious that, in order to overcome the restriction – whether in space or in time – to the infinite Small, it *must* be integrated. At the same time, however, it is evident that it *cannot* be integrated as long as there is no *further information*, that is: *global information.*

For example, consider the description of gravitation in the spherically symmetric case in the Second Part. Here it was assumed that

$$\sigma = \frac{r - m}{r}$$

– which means that there is a highly ordered, stationary state (σ is time-independent). Under this condition, also v can be determined by integration, and statements about a finite spatial area can be derived. They result in the *law of gravitation* (in the spherically symmetric case).

In the general, unordered case, however, the fabric of reality would be represented in the description as *uncountable set* of facts – namely the values of the two variables σ and v (or σ und ζ) at any position of the continuum – which, though they are related to each other by the law, cannot be composed into an algorithm in any way.

Therefore, Laplace was wrong. No matter how powerful the intelligence is that looks at nature – it is impossible for it to deduce the future from the present, because *there is no method* by which this goal could be reached – not even if what happens is determined everywhere and anytime by the law.

As regards the description of reality, we have achieved the desired result. Even if the assumption were permitted that the information that is contained in nature itself could *completely* be transferred to a system of equations, it would not be possible to compress this system of equations to a (finite) algorithm, and the deduction of the future from the present would fail. Thus, the assertion: "The future *follows* from the present" is wrong.

Therefore also the statement: "Everything which happens follows from laws and initial conditions" is invalid, which previously was called the *Completeness Axiom of Science* – and it was exactly this statement that stood in the way of the assumption of free will.

4.3. Why Nature is not an algorithmic System

Nevertheless, the situation is not entirely satisfactory. Due to the fact that in the reality at any point and at any time is determined what happens by a law, the suspicion could germinate that the previously derived result is merely a shortcoming of the description and does not concern nature itself.

Does not this very fact testify that *nature itself* is yet an algorithmic system, in other words: that the future is produced in an algorithmic way?

As starting point of the explanation why this is not the case serves the difference between reality and description, which already has been mentioned several times: any existing object is always *active by itself;* in contrast, objects that belong to a description – or to a model, or a simulation – of reality, are lacking this activity; *by themselves,* they are *passive.*

An example: Let us look at the system *sun, earth and moon.* In the reality, earth and moon are moving *by themselves* – gravitation, which causes their motion, is inseparably bound to their existence.

But if a model of this system is made, then it is necessary to install a mechanism that mimics the movement of earth and moon, and to provide it with energy. *By themselves,* the elements of the model do nothing at all – they just stay in place.

The same applies to a description: one can set up an equation, from which the movement of earth and moon can be calculated in any desired approximation, however the future of the system reveals itself only if the calculation is actually carried out; *by itself,* nothing happens.

With the aid of this simple metaphysical distinction can be understood why *a description system* needs an algorithm to deduce the future, and why *nature itself* in contrast does *not* need an algorithm. As follows:

We stick to the assumption that anywhere and anytime the law *acts.* I emphasized the word "acts", because it contains the explanation why reality – in contrast to a description of reality – need not be an algorithmic system in order to generate the future.

Precisely because the essence of reality is *activity,* the assumption that *now* – at the present moment – at each point of the continuum is determined what happens, is not only a necessary but also a sufficient condition for the development of the future from the present. For the reality, it is sufficient that it "knows" *now* and *at any position* how it has to act. It need not step out of the infinite Small and know the uncountable infinitely many relationships between the points of the continuum. If it acts everywhere in the infinite Small according to its law, then it proceeds *by itself* – even without this knowledge – from the present to the future.

But in a description-system of reality, this is not the case. Even if the system could contain all the information about what happens in the reality at a given time at any position, this would not be sufficient for the generation of the future, because these facts lack the crucial feature: *activity.* The system is passive, nothing happens *by itself,* the future does *not* develop.

Therefore, in the description the mere information, what at the present moment happens at any position, is not sufficient for generating the future. The description-system needs an *algorithm* – a calculation method – for determining the future, and this algorithm must of course contain a procedure by which the restriction to infinitely small space- and time-intervals is abolished.

By this comparison is demonstrated that the *algorithm of the description* takes over the task of the *activity of the reality*. In the reality, the future is generated by *activity,* in the description, an *algorithm* is needed.

Reality, due to its activity, can produce the future solely from the information about the spatial and temporal conditions in differential intervals – which means: without having to leave the infinite Small.

But in the description, if one aims to proceed from the present into the future, one has to know *already now* the relationships between the positions and time points, which are spatially and temporally separated from each other. Expressed mathematically, these relationships must be integrable functions,[3] which however in general is not the case.

In addition, the continuum exists only *as changing,* and this means that all functional dependencies are changing permanently. Time and space changes are inextricably intertwined. What is valid *now,* can be wrong in the next instant. Thus in the general case, integration is impossible. So, one remains trapped in the infinite Small, and this means: one does not reach beyond the present.

In short:

In order to proceed from the present to the future, <u>we</u> need to integrate, but <u>nature</u> does not need to integrate.

Thus it is the difference between the essence of description and reality from which the explanation follows why reality must not be identified with an algorithmic system.

From this fact, a series of restrictions ensues regarding the applicability of notions to reality.

However it is not easy to understand these restrictions, because *all* our notions are elements of descriptions, such that we are always subjected to the temptation to equate description and reality – and this applies in particular in the field of science. So we have to leave the implicitness of our

[3] By "integrable" is meant: the primitive exists, and the definite integral can be calculated.

conceptual network – the meanings of the terms and their interconnections – and expose ourselves to the alienation that comes with the attempt to transfer concepts from description to reality.[4]

The restriction regarding the term "follows from", which appears in the Completeness Axiom, has already been mentioned: Since nature is not an algorithmic system, it cannot be asserted that the future *follows* from the present. Only the statement is permissible that the future *evolves* from the present.

The same applies to the concept "predetermined". Claiming that the future is determined implies that the future can be derived from the present. This would mean that the future is contained in the present – that, in this sense, it exists already. But this is not the case.

Here is a more detailed explanation to this question:

Let's start with an example: Suppose we have the intention to weave a multicolored carpet. The initial series of meshes lies already before us, and we also have a complete set of weaving-rules. Let us now assume that, at some point during the course of the weaving process, on the carpet the image of a lion arises.

The question is: did this lion already exist before the carpet was woven? If this means that the lion can be produced by the initial series of meshes and the weaving-rules – that, in this sense, it is thus contained in them – then the answer is *yes.*

Mathematicians are confronted with a question of the same kind, when they encounter mathematical theorems during the course of their conclusions. These theorems are obviously not invented but discovered. They are in the same way "contained" in the axioms and rules of the mathematical system as the lion is contained in the initial series of meshes and the weaving-rules of the carpet system.

Let us now turn back to our question: is the future contained in the present?

The decisive difference between the reality on the one side and the carpet-system or the mathematical system on the other side is the fact that in the carpet system and in the mathematical system a *procedure* exists, by which the entity whose existence is the subject of our discussion can be fabricated. In the case of the carpet, this procedure is the weaving in accordance with the rules, in the

[4] Since we are *always* caught in the description, it may seem strange to contrast reality and description with each other. However this comparison is justified, because at the limit of describability contradictions occur from which not only follows that description and reality do not coincide but also *how* they differ. The building-up of physics, which has been presented in the Second Part, is based upon conclusions of this kind.

mathematical system, the method which leads to the discovery of the proposition is drawing correct inferences.

But in the case of the reality, there is no procedure that leads us from the present to the future. There is no path to the future besides the one that reality itself takes. Thus the only possibility, to obtain precise information about the future, is to wait until it occurs.

To say it again in the same way as just before:

Even if a description system existed, which would contain all information about what happens at a given point in time at any position of reality, this would not be sufficient for the generation of the future in this system.

Since the system provides no algorithm for the fabrication of the future, the future is not part of this system – it *does not exist* therein.

And finally: even if it were possible in some magic manner to add to the system the metaphysical quality *activity* that reality possesses, then the future would still not be *contained* in the system – it would just *evolve* from it.

So we have come to the conclusion: ***The future is not contained in the present. It does not exist before it occurs.***

Reality is not an algorithmic system.

This statement is more general than that which was necessary to permit freedom of will:

The statement that was necessary for the existence of freedom was: *Mental states cannot be derived from any given system of initial conditions and equations.*

But that reality is not an algorithmic system means:

No state of any area of reality can be derived completely from any given system of initial conditions and equations. [5]

[5] Why, then, exist algorithmic principles at all? This question will be answered in the following sections.

So, in the description of reality, there are only approximations, probability statements and qualitative predictions for reasons *of principle.*

On a readily accessible level of analysis, this appears self-evident. Neither can we measure infinitely accurate, nor encode infinitely exact numbers, nor execute an algorithm with infinite precision.

However all these obvious limitations concern only *descriptions,* and their existence contributes nothing to the elucidation of the question of whether an algorithm *exists,* that is to say: whether *reality itself* performs such an algorithm; In this case, freedom of will would disappear despite the just mentioned restrictions that apply to all descriptions.

The real answer to why there are only approximations lies deeper: it is founded in the fact that reality needs no algorithm. For the development of the future, the differential weaving-rule is sufficient. But this rule is not an algorithm – it can only turn into an algorithm (within a description) in connection with idealized assumptions of additional order.

However if in the reality no algorithm exists, then there is of course no possibility to represent it in the description, and *this* is the reason why any description is just an approximation.

I shall go back to the crucial point of the whole analysis. It is the statement: *The future is not contained in the present. It does not exist, before it occurs.*

Ultimately, only because of this fact it is possible to claim that the will is free. Exactly because a decision *does not exist* before the decision-making process has taken place, it depends on the decision-making process itself and not on any previous state of the neuronal network.

But if reality were determined, then the future – and thus also the volitional decision – would already be given before it occurs. There would be an algorithm that permitted the calculation of the future from the present – precisely the one that nature would perform for generating the future, if it were deterministic – and any decision could be derived from past conditions. (I again emphasize: it is irrelevant that such an algorithm could never be available – the mere assumption of its existence, which would be inevitable in a deterministic view of nature, is sufficient to rule out free will.)

If there is no algorithm, however, then the future does not follow from the past, and then it is not possible, to regard a volitional decision as a result of a previous neuronal or physical state, or of a state defined in any other way. To the question why a person has decided such and not otherwise, there is then only one permissible answer:

Because he/she wanted it this way.

Note:

Of course this does not mean that volitional decisions cannot be analyzed with respect to their (neuronal, chemical, physical, genetic, social etc.) causes. It means, however, that these analyses necessarily remain incomplete and never lead to a secure result, because mental phenomena cannot be reduced to other layers of reality. The will remains the last authority.

Proposition

Let determinism be the thesis that there is at any instant exactly one future [6]. Let indeterminism be the thesis that there is at any instant more than one future. Then the following applies:

The future does not exist before it occurs. Thus there is no time-point where one or more than one future exists. Reality is neither deterministic nor indeterministic.

The alternative deterministic or indeterministic applies only to descriptions, not to reality itself. [7]

From the scientific view, although reality is not in any case calculable, it is in any case *mappable* to a mathematical scenario. In scientific experiments, the conviction is confirmed that nature behaves according to laws.

From our point of view, both assumptions are wrong.

Uncountable sets, which do not exhibit a mathematically describable order, are not mappable. The *general case,* however, is defined as such a set.

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[6] According to Peter van Inwagen: *An essay on free will,* 2nd edition, Clarendon Press, Oxford 1986, p. 3.

[7] Actually, Inwagen defines determinism as the "thesis that there is at any instant exactly one *physically possible* future." However since the concept of "physical possibility" applies only to descriptions and not to the reality itself, the question "determinism or indeterminism" turns into a formal problem. The answer is then: Since there is no algorithm that leads from the present to the future, the question whether there exists exactly one or more than one future cannot be answered. Thus, from a formal point of view, determinism and indeterminism are *undecidable* hypotheses.

But in the formal view gets lost what *actually* should be said, namely the fundamental metaphysical insight that neither of the two hypotheses is true – or rather, that none can be applied to reality.

Moreover, as described before, it is impossible to map the *activity* of reality. That, what promotes reality, can only be mathematically emulated by an algorithm. The existence of an algorithm, however, presupposes a degree of order which exists only in idealized cases. Every real case, however, corresponds to an uncountable set of facts, and, as such, it is not completely describable.

The second wrong assumption is that nature behaves according to laws. Though this assumption is confirmed in some areas of nature in almost unbelievable approximation, it is nonetheless metaphysically wrong:

Reality is not a system of laws. The *only exact law* is the fundamental law (1). All other laws, also the so-called natural laws, *develop* only in the course of the evolution of nature. And since they are not about unchangeable entities but about attractors – which means: about dynamic states that are *never* completely identical –, they do never apply completely accurately.

Basically, the question of whether laws exist is of the same kind as the question of whether circles exist. In the reality, there are no circles. Each real circle is an approximation. The non-existence of circles is not a matter of probability, but a *metaphysical certainty*. Circles are elements of descriptions, not elements of reality. [8]

If reality as a whole were a mathematical or a formal system S, then states of physical systems would be *statements* in S. With respect to any future state could then be asked if it is derivable in S.

However any S contains a fixed set of rules or laws from which all other laws can be derived, whereas in the reality new non-derivable laws evolve. It is the non-mappable metaphysical quality *activity,* which causes this evolution.

From this follows that reality cannot be understood as a system S. If it would be identified with such a system, then it would permanently generate states that correspond to *undecidable statements* of the system.

The only thing that can be said is that identical circumstances have identical consequences. Usually, this is seen as criterion for determinacy, because it means that there are no bifurcations in the evolution of reality – in other words: if there were another universe whose present is completely identical with that of our universe, then also the future of this second universe would be completely identical with that of our universe.

[8] All issues that have just been touched on will be discussed later in detail.

Therefrom is then further concluded that nobody would ever be able to "decide otherwise", because in any case the outcome has been "determined" already before.

From the foregoing, however, it is clear that this conclusion is invalid. Here, "being determined from" has the same meaning as "being contained in", and since the future is generally not contained in the present, it cannot be claimed that a decision is determined already before.

This assumption would only be possible if reality were understood as a system S; but then the result of the decision would correspond to an undecidable statement of S, and the claim of an already given "determination" could not be maintained. [9]

[9] The assumption of another universe which is identical with our universe is inadmissible – even as gedanken experiment, because it includes the wrong presupposition that it were possible (of course only *in principle*) to reproduce the reality, which means: to transfer all the information that is contained in our universe to another universe. This, however, is impossible: even if infinitely many equations of infinite length were permitted – they could still not contain an uncountable set of facts.

4.4. Causality top-down

The assumption, that everything is determined at the elementary layer of reality, has dissolved, the stranglehold on mind has come off.

Nevertheless, the conclusions of the last two sections – despite the elimination of the contradiction between freedom and determinism – would have no effect, unless they are supplemented by the principle of *causality top-down*.

What is causality top-down? First I will explain it again with reference to the examples I've used in the previous chapter.

Let us first consider a jar made of glass. It is struck and vibrates. Let us take out any molecule. What determines the oscillation state of the molecule?

Obviously not its local environment, but the *form of the entire jar*. It is the form that structures the state space and defines in this way the dynamics of the jar and of all its components. The constant form, which is preserved over time, becomes the basis of a law: the oscillation law of the jar.

In short: *The whole – the jar – determines the movement of the parts (the molecules).*

The same is true for a *neuron*. Here, however, not only the outward form, but also the internal (physicochemical) *structure* is important: the state space of the neuron is structured by the external form and the internal structure of the neuron. Together, they determine where and in what manner electrical potentials are generated, transported, and finally converted into chemical signals and passed to other neurons.

Here, too, the state dynamics of the neuron is determined by form and structure. In a strictly local view, it would be impossible to predict the activity of a molecule or atom. And also here, constant form and structure of the neuron provide for the occurrence of a law: the neuronal input-output-law.

Also in this case applies: *The whole – the neuron – determines the actions of its elements.*

As final example, we choose mental states. They are global activation patterns of neuronal networks which however, as outlined in the previous chapter, are not determined by the neuronal input-output-law and the architecture of the neuronal network – those neuronal activities, that occur in functionally unbound (associative) areas due to these two conditions, can be regarded, in our context, as entirely by

chance – but are impressed on the network through external conditions (by real objects and processes), such that the patterns can become representations of the objects.

Mental states structure in this way the state space of the network, and the sequence of mental states determines the dynamics of the network. The process is again regular: it follows the respective (individual) mental law, which is based on the (approximate) constancy of mental states – understood as global states of the network – and the transitions between them.

Again, it can be asserted: *The whole – the mental processes, understood as global phenomena of the neuronal network, which represent attractors in the state space of the network – determines the dynamics of the network and of its elements.*

What is true for these examples is also true in general: form and structure of an entity determine its dynamics. The direction of causality is not "bottom-up", but "top-down", or, in other words, the dynamics of an entity depends not (only) on its components and their interactions, but (also) on its form and structure; they are the ones who determine the structure of the state space of the entity and make the selection of possible trajectories.

Here, it is of crucial importance that reality is not an algorithmic system. For if it were, then the causality "bottom-up" would be *complete* and there would be no room for the causality "top-down". It would be enough *once* to enter the correct initial conditions into the fundamental law-mechanism, and then the mechanism would continue for eternity.

Causality top-down would then be no independent phenomenon; each description on a higher layer of being would be nothing more than a simplified representation or summary of facts that follow from the circumstances on the respective deeper layer of being. With this, however, everything would ultimately follow from the deepest layer, and all other layers of being would have lost their self-dependence.

This can be illustrated by the following simple example: The operation 2+2=4 on a pocket calculator can be described in two ways: on the entry level – as a series of 4 keystrokes – or on the electronic level. In this case, however, it is clear that the causal relationships are to be sought in the logic circuits of the electronic level and not in the key strokes. The result 4 is related with the input keystrokes only via the circuits. Thus the level of the keystrokes is not a self-dependent layer of reality, and the description of the process by the sequence of keystrokes is just a simplified representation that does not contain the causal relations.

If reality were an algorithmic system, then the circumstances would be in all cases equal to those of the pocket calculator. Thus the proof that reality is not an algorithmic system is necessary for the existence of self-dependent, hierarchically higher layers of being.

The thought train, by which this self-dependence can be substantiated and which ultimately leads up to the freedom of will, can be outlined – including the statements of this chapter – in the following way: It begins with the division of the scientific description of reality in *equations* and *initial conditions*, i.e. in mathematical relationships between variables and the values of these variables at a given time.

Due to the assumption that the world consists of a finite number of elementary interacting entities, current physics encourages the idea that initial conditions are the values of the attributes of such entities, and global circumstances can be acquired algorithmically. Though, as demonstrated previously, the assumption of calculability of nature is wrong even under the condition of the existence of elementary entities, still the full significance of the two elements of the description – initial conditions and laws – becomes only clear when viewed from their logical and metaphysical presuppositions, from which in the Second Part the development of reality has been reconstructed.

Here, the deepest layer of reality is *alteration of* NOTHING. By defining NOTHING as the necessary and sufficient conditions of existence, this layer turns into an ever-changing space-time continuum, which exists only in the form of this change and whose only rule is that the differential alteration of the metric density of space is equal to the differential alteration of the metric density of time.

Thus, in the *origin of everything* there is only one single law, and this law acts in the infinite Small. In general, from this law cannot be derived any algorithm, not even in connection with initial conditions, because these initial conditions vanish into infinity. It would be nonsensical to denote the uncountable many values of σ and ζ as initial conditions. Instead they must be seen as *varying global state,* whose essential characteristics is that its spatial and temporal relations cannot be captured algorithmically – not without the assumption of additional order. Because of this fact, the statement: "The future follows from the present" becomes wrong. The future global state is not derivable.

Therefore, the second element of the description, which is no longer called "initial conditions" but "global state", obtains an *essential independence* that it does not possess in the conventional view.

As has been shown, exactly this independence of the global state is the basis for the proof of the self-dependence of complex being. That, which appears as *form and structure* of being, is indeed nothing other than this very global state: from the conditions which, in the general case, are random and not ascertainable, develop – due to the self-organization of nature – form and structure of being, and this means: *causality top-down* evolves.

Thus, the development of being is tantamount to the development of new laws, which determine the inside and outside dynamics of this being. In simple, idealized cases, the global state can be algorithmically compressed, that is to say: it can be brought into the form of solvable systems of equations.

What in standard-physics is seen as elementary layer of being, is – from the position taken here – the first and simplest layer of reality, which evolves from the *origin of everything,* and the so-called *natural laws* of standard-physics turn out to be laws of the kind that in the previous chapter were denoted as *laws of form* or *laws of structure.*

However the evolution of nature progresses further: the simplest kinds of being unite to more complex entities, and again new laws evolve.

From this point of view, between nature and its description the following relationship exists:

1. No description system can reproduce reality exactly. It is *applicable* for the description of reality, if it contains the objects that occur in reality and represents their behavior in sufficient approximation.

2. Increasing complexity of nature means increasing complexity of description. If structures of higher complexity emerge, then the previously applicable description system must be replaced by a more complex one, which contains the previous one.

If there were a Theory of Everything, it would have to represent the ultimate system, that is: the one that encompasses all the previous systems. But in any case holds that – due to the appearance of mental states – there cannot be a description system that applies to nature *as a whole,* because mind lies outside of the area which can be described by given laws.

However, since mind is part of nature, a Theory of Everything cannot exist.

4.5. On Order and Laws

This section contains some notes about the development of order and about dynamic laws.

About the emerging of order, however, I have to say nothing substantial. Nonetheless it seems imperative to me, to present at this point at least the bare essentials, so that they can take their rightful place in the argumentative context.

I avoid the difficulty to define order; for the purposes of the following discussion, it is sufficient to regard order as the generic term for the concepts form, structure, regularity, periodicity, etc.

After the foregoing, the following applies:

The scientific description of nature consists of *law* and *global state.* The law remains always the same. Therefore, the formation of order is always a change in the global state, which develops from random circumstances to ordered circumstances.

The emergence of being is tantamount to the formation of order and of laws of structure, by which this order is expressed. The emergence of more complex being entails additional, higher order and further, hierarchically higher laws of structure.

Now the most important question is undoubtedly: *How* does order develop?

Given the fact that neither the global state itself nor its temporal evolution can be captured algorithmically, it seems at first as if the emergence of order would escape any description.

But this is not true. In many cases it is possible, due to given boundary conditions, to gain information about the structure of the state space of a system – in particular about the attractors therein – and to draw conclusions whether the system will approach an ordered state.

Especially at the beginning of the self-development of nature – that is, where the conditions are most simple because they arise out of mere necessity – and at the (to our current knowledge) most complex (provisional) endpoint of this development it is possible to understand the emergence of order at least in principle.

The insight, how the universe organizes itself at the very beginning, follows – as described at the end of the Second Part – from the assumption that it is a closed metric structure of unchangeable size, which therefore will approach the simplest attractor: the state of standing waves. [10] (It must be taken into account, however, that this conclusion would only be correct if the universe were an ideal-elastic medium. Since it is a space-time continuum, which has no absolute density, the circumstances are

[10] To the unchangeable size of the universe see chapter *8. Cosmology* in the Second Part. I don't know if the closeness of the metric structure follows from the fundamental law itself, in other words: if the closeness is the only boundary condition that is compatible with the law. I suppose so. Otherwise it would have to be assumed as an additional condition.

more complex, and the standing-wave-attractor is presumably only one of several organizing mechanisms.)

At the end of the development, where the order of the realm of mind commands, the emergence of order can again be understood through the assumption that mental states are attractors, which are impressed on the state space of the neuronal network by the perception of objects and events and their connections with inner information.

If the emergence of the mental order is seen in this way, then it corresponds quite naturally with our intuitive notion of the mind.

As chaos dynamics teaches, however, it can be extremely difficult to determine the attractors in the state space of a system and with it the self-organization of the system into organized patterns. Not before the 60s of the 20th century, this kind of processes has come into the view of natural science, and, after a period of media attention, it remains to this day – because of the great mathematical difficulties and the consequent slight chance of quick success – the little beloved stepchild of science, although it seems obvious that the question of the emergence of order would deserve at least the same attention as the currently prevailing investigation of processes that are governed by natural laws – or, from our point of view: by laws of structure.

Are the processes of self-organization not of this kind? No, they are not. The laws which they follow represent indeed a further type of laws that meets two criteria:

1. Self-organization presupposes non-linear feedback. Therefore, the equations are non-linear.

2. The equations contain variables that do not relate to the attributes of single localized entities – rather they are *global* variables, that is: variables that represent attributes of the system as a whole.

The second statement means that also in the laws of the generation of order – as in the laws of structure, in which an already existing order expresses itself – the global state determines the temporal evolution of the system.

In order to understand this as an *ontological* statement, also in this case the (previously demonstrated) independence (underivability) of the global state must be presupposed – otherwise the *global parameters* would be, as in the conventional view, only inaccurate summaries of local circumstances and not an autonomous element of the description.

To illustrate these circumstances, here an example: the first known chaotic system, the "Lorenz system" (named after its discoverer), which describes the dynamics of a viscous incompressible fluid between two plates, between which there is a temperature difference.

The system has 3 variables – let us call them X, Y, and Z – which are defined as follows: [11]

X is proportional to the absolute value of the convection speed.

Y is proportional to the temperature difference between ascending and descending flow.

Z is proportional to the deviation from the linear vertical temperature profile.

If the temperature difference ΔT of the two plates lies above a certain limit r_0, then the System behaves chaotically, and in the state space the well-known *Lorenz-Attractor* emerges.

Since the Lorenz-System has only one attractor, for $\Delta T > r_0$ in any case – *independently of the initial conditions* – the system approaches the state, which is represented by the attractor.

Therefore, the behavior of the system is governed by *global parameters* – they determine the pattern which in the state space develops.

In this example, the following characteristics can be found, which are typical for the mathematical description of self-organization:

1. The system is to a certain extent independent of initial conditions of the type, which hitherto has been discussed, that is: from initial conditions in the form of values of variables that represent object-attributes or field quantities.

2. Therefore, not the behavior of the elements of the system is investigated – that would be impossible –, but the global long-term behavior, that is: the patterns which the system will approach. They are attractors of the state space. (For the pattern-formation, in particular chaotic attractors are relevant.)

[11] What follows is taken from a work of *Andreas Jung,* which can be found at http://andreas.welcomes-you.com/research/talks/lorenz/

Thus it is evident that the processes of self-organization represent another, new area of the description of nature, where the goal is not, as elsewhere in science, the most accurate and detailed determination of a future system state, but the attainment of *shape information.* [12]

The principle of self-organization fits in the following way into the here presented overview of the development of nature:

In the preceding sections of this chapter and in the previous chapter has been shown that, in the general case, the global conditions cannot be used to achieve an algorithm for calculating the temporal evolution of a system. Therefore, it remained unclear how this evolution could be understood.

Here, self-organization by feedback is the necessary complement: If a description by an algorithm, which involves variables that correspond to the attributes of individual objects, is impossible – which applies to the general case, because there such an algorithm simply does not exist – then the analysis of the global conditions takes its place, and the description is performed by means of variables which represent global attributes.

4.6. Some Consequences

The Independence of global Parameters

Though the description of chaotic feedback systems can be deterministic – as e.g. in the Lorenz system –, according to the analyses of the sections 4.2 and 4.3 it would be inadmissible, to infer from the determinism of the description the determinism of the system itself.

I outline the reasoning again:

In a linear system, as would be for example in sufficient approximation a large amount of gas molecules in a closed container, there is – at least in principle – an algorithm through which from the positions and momentums of the molecules the development of the system could be determined.

[12] However, in many chaotic systems (e.g. the weather) the patterns are only perceptible in the state space. In the reality, they remain hidden because they lack exactly that, what is the necessary condition of *being:* the *form* that exists in the real 3-dimensional space and is conserved over a certain time period.

Of course, given a number of, say 10^{26} molecules, it would be completely absurd to actually try this type of description, but there is nothing against the assumption of the existence of such an algorithm. Therefore, this (idealized) system is deterministic.

In contrast, in a non-linear feedback system such an algorithm does not exist *on principle.* This has been demonstrated in 4.2 and 4.3 for continuous self-organizing systems. But it applies also to systems that consist of a finite number of bodies that interact with each other, e.g. a system of a large number of gravitating bodies.

What does it mean, then, that the equations, by which a self-organizing system is described, are deterministic? The answer is as follows:

The deterministic equations do not contain all details of the system state. They do not refer to attributes of the single elements of the system, but to global attributes, that is: such of the whole system. The details are ignored.

Thus, it is a "qualitative determinism". Two systems can satisfy the same chaos-dynamical equations, although they differ in the details. They would approach the same attractor, but they would nonetheless be distinguishable.

Local differences remain excluded from this "qualitative deterministic" description, and, therefore, from the fact that the equations of chaos dynamics are deterministic cannot be inferred the determinism of the systems described by them.

One is thus faced again with the *independence of the global state* – and here, this is equivalent to the independence of the *description by global parameters*.

Therefore, such a description cannot be understood merely as an inaccurate summary of local deterministic occurrences. It is independent of these and thus represents a *fundamental level* of description – in the sense that it can *not* be reduced to equations of motion that apply to the single elements of the system, because such equations simply *do not exist*. And this is the real reason that the principles of the description must change, in other words: that one has to switch from the local description to the global analysis of morphogenesis.

All of this is also true in the conventional approach. However, the circumstances will only be completely clear when viewed from the build-up of physics presented here:

Here, there is not a layer of elementary entities, which everything consists of and whose dynamics determines everything. Instead there is a continuum and its differential law. But from this law alone follows *nothing.* In any case the *global circumstances* are required. This means: here, law and (variable) boundary conditions – i.e. *law and global state* – are equivalent. They exist only together. There is always causality bottom-up and top-down at the same time.

The validity of the deterministic equations of chaos dynamics, which contain global parameters, proves that in self-organizing feedback systems indeed the *global state* takes the lead and determines the development of the system.

Objects; Object-Attributes and Interactions

Let us assume that an area of the space-time continuum has evolved due to certain boundary conditions from a disordered to an ordered state, and there had thus a pattern emerged that manifests itself not only in a state space, but also in the real three-dimensional space. Let us further assume, this pattern remained virtually unchanged over a certain period of time (this can be a billionth of a second or also 100 billion years).

Then *being* has emerged – an object that has form and structure and displays certain attributes.

However it is not *elementary* (in the sense of substantially indivisible and structureless), but a *dynamic pattern*, and therefore its attributes are nothing other than *global parameters*.

While the description of the formation of being requires the use of time-varying global parameters, the entity itself – that is: what appears as (approximately) stationary final product of this formation process – must be described by (approximately) constant global parameters, and these are then obviously the attributes of this being. Examples are *electrical charge* or *mass*, or the properties of states of the so-called *electron shells* of atoms

They serve then as variables in *laws of structure* that describe the interactions between objects with these attributes: electromagnetism, gravity, atomic and molecular dynamics.

With this, the layer of reality is reached that in standard physics is considered elementary.

At this level of simple physical objects and their interactions we meet again the phenomenon, which previously has been determined as essential ontological feature of the dynamics of the fundamental

layer (the space-time continuum that is the precondition of every being). Like the continuum itself, also the systems which consist of such simple objects and to which the laws of structure apply that emerged together with these objects, are only then algorithmic systems, if they contain *more* order than that which is given through the laws alone. If this is not the case, then the development of the system depends again on global parameters (of higher order), and, under appropriate boundary conditions, again new, more complex objects can emerge, with new attributes and new interactions etc.

How often this step by step upwards moving development can repeat itself depends on the respective conditions. The only system that we currently know, which permits an evolutionary ascent over several stages up to being of remarkably high complexity, is the biosphere of the earth.

The Direction of Time as a fundamental Fact

Due to the considerations of the last sections, the question about the direction of time presents itself in a new form.

The mathematical expression for the process that generates the reality is $\frac{d\sigma}{dr} = \pm \frac{1}{c^2} \frac{dv}{dt}$.

Thus it is a *differential* process, and from this follows that statements, which should correspond to states of reality, would have to comprise an uncountably infinite set of facts and could not be compressed to finite statements.[13] But this means that states of reality cannot be completely mapped by any mathematical system.

From this follows that all mathematical concepts, which the description of reality has hitherto been based upon, have only the status of approximations. This applies e.g. also to the Hamiltonian Formalism, which generally serves as basis for the prove of time reversibility. Even the phase space concept itself is involved – there is no phase space with uncountably many dimensions – and is thus only suited for approximately valid or qualitative statements. (In the following, I will use it in this sense.)

Therefore, the assertion: "Time reversal is possible" or: "In the phase space of a system also the reversed trajectory exists" must be weakened to the assertion: "Time reversal is approximately possible" or: "In the phase space of a system trajectories exist which approximately conform with reversed trajectories".

[13] Presumably applies that they even could not be compressed to countably infinite statements.

Also this weaker assertion, however, is only true for systems in which the time evolution can be expressed through equations of motion of the components of the system – a typical example would be a system with a great number of gas molecules in a closed container –, but it is completely wrong when applied to systems which evolve to an ordered state or maintain such a state. As elucidated above, this kind of systems is not governed by laws of motion of elementary objects – such objects no longer exist, as the points of the continuum are not "objects" –, but by equations, through which the time evolution is expressed by global parameters: the non-linear feedback equations of chaos dynamics. Time symmetry, however, means reversing the movement direction of *all* components of a system. But since the local regularities of the point-movements obey the global laws, such a reversal is obviously impossible, and this means: the time-reversed development is ruled out.

Therefore, the direction of time is no longer a question of probability: except for idealized special cases, time-symmetry is impossible for reasons of principle, that is: for metaphysical reasons.[14]

Being as Attractor

Everything that exists is a pattern of changes in the space-time continuum. Since every being conserves its form over a certain time period, it must correspond to an attractor of the continuum dynamics – and this applies to *every* being, from elementary objects up to mental states. With this, it is at the same time clear that being is never identical with itself at different time points. This can be demonstrated as follows:

There are three types of attractors: fixed points, cyclic orbits and chaotic attractors. Fixed points correspond to static states. In a reality that exists only as changing, such states are impossible.

Therefore, our choice is restricted to cyclic and chaotic attractors.[15]

[14] Ilya Prigogine is known for his intention to derive the direction of the time from the laws of self-organization. But I think that this project is doomed to failure, if not at the same time the assumption is refuted that there are fundamental equations of motion, which contain the dynamics of the elementary components of a system and thereby determine the entire system. It is basically the same facts as in the case of Free Will: The dominance of the Global over the Local can only be asserted if there is no fundamental layer of reality by which the future is generated in an algorithmic way.

[15] In addition, there may be steady states in the form of singularities, as in the case of black holes, where a spherically symmetric, temporally constant metric flow into the center exists.

Does being correspond to chaotic or to cyclic attractors? Presumably there are both variants. If, as in quantum mechanics, the possible states of objects and systems form discrete sequences, then they are comparable to standing waves and correspond therefore to cyclic attractors. In this case, in the representation of states and transitions between them the fundamental non-linearity of the real, causal events can be neglected (as is done in quantum mechanics).

However states, which correspond to standing waves, are never completely identical with each other. As illustration, consider again an acoustic scenario for comparison: If two buglers blow the same tone, then the probability that the oscillation states in both instruments are identical is nonetheless equal to zero. The same applies to the oscillation states in the same instrument at two different points in time.

And the same applies also to standing wave states of quantum mechanical systems – and precisely this fact is the reason why for the time points of the transitions between such states only probabilities can be predicted. [16] [17]

Therefore, in the case that a being corresponds to a cyclic attractor, precisely applies what was initially claimed: It is never exactly the same. This also implies: Two objects of the same type are never completely identical.

Let us now consider the second option. If a being does not correspond to a cyclical but to a chaotic attractor, then the claim follows from the definition of the chaotic attractor: The trajectory never goes twice through the same point, and this means that there is no being that has a completely identical shape at two different time points. And also in this case applies that two objects of the same type are never completely identical.

Are there any objects that correspond to chaotic attractors? Probably yes. The non-linearity of the occurrences within the atomic nuclei suggests that nuclei are such objects. *Mental states* could also be chaotic attractors.

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[16] Unfortunately, currently prevails the interpretive misunderstanding, they were "objective" probabilities. But actually they are "normal" probabilities whose occurrence can be explained through the existence of a deeper layer – the layer of pattern-formation by feedback and of the continuum flows and waves that cause these patterns and reversely are also structured by them.

[17] Due to its structure in the form of standing waves, the area of atoms and molecules is that realm of reality which comes closest to algorithmic describability. But even if the fundamental non-linearity here seems completely dispelled, this is ultimately an illusion. The restlessness of the continuous background – even if it remains immeasurable – and the inevitable disturbances from outside prevent that any quantum mechanical system can ever reach a dynamic equilibrium and would then be fully linearized.

The fact that being never stays identical with itself has the consequence that laws, which contain variables that relate to attributes of being, can ultimately only be *probability laws,* or, if they are not formulated as such – as e.g. in the case of the theory of general relativity – their predictions cannot be completely precise. Complete accuracy would only be achievable if one could penetrate to the deepest level of reality – to the level where reality coincides exactly with the fundamental law. But this is impossible, because there one would again arrive at the uncountably many values of the two variables σ and v.

The question arises, to what extent it will ever be possible to describe the non-linear processes that ultimately are the prerequisite for the emergence and transformation of being. Undoubtedly, such a description would be much more complicated than the simple assumption that the simplest forms of being are not dynamic patterns, but fundamental, substantial entities.

After all, it should be noted that the current gain in simplicity is bought at the price that, due to false basic assumptions, those processes where the fundamental non-linearity becomes apparent – and such processes exist with certainty – can only be described by formalisms which, though they are indeed quantitative approximations to reality, miss reality completely as regards its actual structure.[18] The hypothesis of elementary entities makes the way to the actual structure of reality completely inaccessible.

But even if the difficulties of non-linear description should prove to be insurmountable: As has been shown in the first part, a significant progress of understanding is already achieved by correcting only the interpretation. Reality opens up to the conceptualizations that are at our disposal, and the absurdities of the contemporary interpretation disappear.

The three Types of dynamical Laws

There are three types of laws that govern the dynamics of systems:

a) A differential law that acts in the infinite Small. It is the fundamental law. The fabric of reality is woven by it. In this sense, it is *THE Law of nature* or *the universal formula.*

[18] As already mentioned in the second part, I think that the processes of the so-called strong interaction are of this kind.

In the general case, the global state cannot be compressed into an algorithm. Exact predictions about finite spatial areas are impossible.

b) The laws of the formation of order. They contain feedback and are non-linear. Their variables correspond to global system attributes.

The reason for the use of global variables is not the lack of knowledge of the local conditions – even their complete knowledge would not be sufficient to determine the temporal development of the system[19] – but the fact that in self-organizing systems the temporal evolution, that is: the shape formation, is determined by the *global state* and can therefore only be captured by a description through global parameters.

c) Laws of structure.

They exist due to an already existing order. They permit to describe the dynamics of entities and their interactions, which are elements of a higher layer of reality, which means that they have emerged by laws of the second type.

All laws of structure are probability laws. If they are not formulated as such, they are not completely exact.

Possible Weakenings of the Conditions; the Issue of Discretization

For the proof that the global state is an independent element of the description – which in turn is a necessary prerequisite of the independence of mind and free will – the basic assumptions of my physical system have been used: Space and time are continuous; the law that generates reality is differential. Reality is a differential fabric of space-time alterations.

Noting that the current physics assumes a fundamental quantization, the question is of interest, how far these conditions can be weakened, without the results being lost.

[19] In the case of the simplest forms of being – those ones which emerge through the self-organization of the continuum – this assertion is evident, because here the totality of the local conditions is an uncountable set. However also in the case of self-organizing processes, where not the continuum but a large number of objects organizes itself into patterns, the existence of an algorithm for calculating future states of the system is ruled out due to feedback. Consider again the example of numerous bodies which are gravitationally bound to each other.

If space and time were discrete, then the universe would be a finite algorithmic system, and everything would be determined.

So at least must be assumed that either space is continuous or time. However, they cannot be separated from each other: If one of them is discrete, then also the other. It is therefore necessary that both are continuous.

The simple example of a system of many bodies that are bound together by Newtonian gravitation shows already that, even in this view, no algorithm exists that leads from the present into the future.

So even such a universe is not determined, and therefore all conclusions remain correct, which have been performed here.

This applies also to the case where all interactions are quantized, and where all beings can occupy only a discrete sequence of states: Also here, the assumption of continuity of space is sufficient, because from it follows that there are infinitely many possible positions in space for any being, which again rules out the existence of an algorithm.

However, based on such assumptions it would hardly be possible to formulate and understand the difference between reality and description.

Additions

1. Equation (1) is linear. Why then can self-organization of the continuum by non-linear feedback occur?

The first reason is that the transition from the infinite Small to the Finite is at the same time a transition from the Linear to the Non-linear.

For example, consider waves. Waves are actually *always* non-linear – a fact which in practice may be neglected because either the amplitudes are small compared to the wavelengths, or because the waves behave just due to nonlinear feedback as if they were linear.

What is true with waves, applies also in general: equations that describe the dynamics of the continuum must contain – if they are to apply exactly – nonlinear terms. Taking into account these terms, one is immediately confronted with a complexity that is hardly manageable mathematically.

The second reason is that the non-linear equations of self-organization do indeed *not* follow from equation (1), but represent, as has previously been shown, a second, independent element of the description.

2. I have focused here on the concept of "causality top-down". Of course there is also "causality bottom-up" and "causality at the same level". However, about these two types of causality nothing must be said. The only problem is that currently the tendency prevails to consider them as the only two kinds of causality.

However, in order to justify causality "top-down", which is a necessary prerequisite for the autonomy of mental phenomena, it is required – as has been shown in this chapter – to change the current scientific view of the world.

4.7. The altered Picture of Reality in the Overview

Nature unfolds from the present into the future by executing at every position the fundamental law (1).

This temporal progression of the reality cannot be reproduced in descriptions, because descriptions are lacking the metaphysical quality *activity.*

Therefore, in the description it is not sufficient to know the law and the initial conditions. In order to derive the future from the present, additional knowledge about finite areas must be available.

Expressed mathematically: it must be integrated, which, however, is not possible in the general case.

This means: no future state of a system can be completely derived in any description. The future is not contained in any description.

Thus the future does not exist, before it occurs. In other words, at any given time there is neither exactly one future nor more then one – there is no future at all. Reality is neither deterministic nor non-deterministic.

Here, again a difference between reality *in itself* and reality in a description reveals itself:

Descriptions of reality are either deterministic or non-deterministic. But reality *in itself* does not fit into the scheme of determinism and indeterminism. It eludes this alternative. Although the real future

emerges from the real present, the description of the future does not follow from the description of the present.

If reality is neither deterministic nor indeterministic – what is it then?

As always, when it is asked about reality *in itself,* this question cannot be answered directly, however one can approach the answer by leaving the differential perspective and turning to the global (topological and metric) conditions.

Since the totality of the differential conditions is not sufficient to establish a procedure to generate the future from the present, the description through global parameters and boundary conditions becomes an independent element of the description.

This kind of description has a twofold significance:

1. The *emergence of order* can be expressed by non-linear feedback equations in which the development of a system is represented by time-varying global parameters.

2. Provided appropriate boundary conditions, in the phase space of such systems exist attractors, which the system approaches. *Everything that exists* corresponds to such an attractor. Therefore, the attributes of being are (approximately) constant global parameters, which relate to how the attractor structures its space-time environment.

Global conditions are thus responsible for the emergence of order and also for the regularities that result from the order that has developed in this way: finite areas of the continuum organize themselves to entities with certain attributes and to structural laws (interactions) that occur simultaneously with those entities. In this way, a first, elementary layer of *existence* emerges, which consists of objects and laws of structure (interactions).

Also in this layer of elementary objects, however, in the general case the knowledge of the laws and initial conditions is not sufficient for the derivation of the future. Again additional order is required.

How does this order develop? In the same way as before: Provided appropriate boundary conditions, the objects organize themselves into structures and forms, and again a new, more complex layer of objects and structural laws emerges. And to understand this evolution, it is again necessary to change from the local perspective to the global perspective.

The same game can repeat itself several times, whereby again new layers of being develop. At all those layers, reality approaches algorithmic describability, without ever reaching it completely.

Back to the question, what the status of reality is regarding the alternative determinism – indeterminism.

The equations of self-organization by feedback are deterministic, i.e. the time-dependent global variables have distinct values at each time point. The local details, however, are not contained in these equations. This means: the equations do not represent a complete description of the system, and therefore the determinism of the equations cannot be transferred to the system described by them.

So it remains an incomplete determinism, which concerns only the global long-term behavior of the system.

Thus, with regard to the question "determinism or indeterminism", the following picture emerges:

a) The totality of the local (differential) conditions is not sufficient for determining the future.

b) The description through global parameters is indeed deterministic, but local differences are not taken into account. Thus only the pattern formation is determined.

The connection of the two statements illustrates, how the metaphysical characteristics of reality *in itself* – that is: to be neither deterministic nor not deterministic – reveals itself on the side of the description:

In the differential approach, the future does not follow from the present. In the global approach, the development is indeed determined, but only with respect to the emergence of form and structure.

Thus, if one wants to grasp reality by means of the scheme deterministic-indeterministic, one can only assign to it a qualitative, so to speak a "soft" determinism.

In this view, there is no longer any contradiction between the assumption of free will and the fact that nature behaves everywhere and anytime according to a law.

Since reality is not determined by the totality of the local (differential) circumstances, the global state, expressed by global parameters, becomes an independent element of the description, and, moreover, it can be asserted that the laws of the respective most complex layer of being, in which the attributes of the elements of this layer appear as variables, are the dominant laws.

This fact enables the justification of the principle of *causality top-down,* through which the dominance of the most complex layer is expressed.

In us ourselves, this is the layer of mental processes.

With those statements, the relationship between local and global description is clarified:

Though they are interrelated, they are still independent procedures. Neither of them is derivable from the other, their relationship cannot be formalized. Only through the combination of both, it is possible to achieve an understanding of reality that escapes the alternative deterministic – non-deterministic and in which the phenomena of mind and free will can take their rightful place.

An Aspect of physical, philosophical and religious Significance

For us, the *origin of everything* is NOTHING that changes.

Brought into the form of a statement, it is the simplest possible fact; expressed as law, it is the simplest possible law.

The essential point is that here the principle of necessity reigns which enforces the greatest possible simplicity.

Therefore, in that, what the *origin of everything* is *for us,* there is nothing except *activity*, the metaphysical principle of the reality. If the necessary conditions of existence, space and time, are added, then the *origin of everything* assumes the form of equation (1).

But in physics, in philosophy and in the various religions, it is usually assumed that the order, into which the universe unfolds, must exist in some form already *at the beginning*.

However, the conclusions of this chapter show that this assumption is wrong. The future is not contained in the past, and the future order is therefore also not contained in the past.

At the beginning, which however is to be understood only as the beginning of the unfolding – or, more correctly, as the beginning of *one* unfolding – of the universe and not as the beginning of its existence, there is only the self-altering NOTHING. This is just it itself and nothing else – not the All-One, not God or however the religions call the primal ground of reality. It is not the "Absolute", it

is no will, no intention, no organizing principle, no order, also no "state of minimal entropy"; It "contains" nothing of what will be in the future. It is just NOTHING.[20]

Due to its differential action, it proceeds into the future by generating ordered global states.

Precisely because the differential law is just the simplest possible equation and nothing else, the greatest possible structural richness can unfold from it and from the respective emerging boundary conditions: Through the simplest possible differential law, the least restrictions are imposed on the global structural evolution.

(Continue to the next chapter 5. Qualia.)

[20] Analogously to the definition of the "essence of being" that will follow in section 5.3, the essence of the *origin of everything* is its unity of substance and metaphysical quality *activity*, i.e. its "in-itself-ness", as far as it can be captured conceptually. Therefore at least can be claimed that it lies in the essence of the *origin of everything* to unfold into all those kinds of being which we experience, and also into all those kinds of being which are possible at all.