Knowledge Processing in an Anticipatory and a Non-Anticipatory Mode

Hanns Sommer
Department of Mechanical Engineering (FB 15), University of Kassel (GHK)
Mönchebergstr. 7, 34109 Kassel, Germany
Phone: 0561 8043261, Fax: 0561 8047768
email: sommer@rts-pc1.rts.maschinenbau.uni-kassel.de

Abstract

It is shown that classical logic is too restricted for an understanding of many effects in modern physics. A more general logic, that distinguishes between anticipatory and non anticipatory knowledge processing is introduced. The cognition process, that deduces from the measurements the physical laws with this logic, provides a unified view of quantum mechanics and relativity theory.

Keywords: anticipation, cognition, holism, quantization, reasoning.

1 Introduction

The empirical knowledge, we obtain from our world is deduced from measurement data. Cognition means the process of identification of a description for this measurements in a fixed language (Ljung, 1987). This language had to be disposable at the beginning of the cognition process. The description language used for our understanding of the world is the formalism of our logic. The principal problem of our cognition process is that the limitation of our logic form prejudices which enter into the knowledge obtained in the identification process. This prejudices cannot be detected in our logic itself and may impede the deduction of a contradiction free knowledge from the measurements.
We show in this article that the problems of our understanding of the effects in modern physics are caused by the use of classical logic. Some consequences of classical logic contradict to an understanding of the measurements obtained from quantum mechanical objects. This observation forces us to introduce a more general logic: the logic of natural reasoning for the cognition process. In this logic it has to be distinguished between an anticipatory and a non-anticipatory processing of the knowledge. D. Dubois (Dubois, 1998) has already shown the importance of the concept of anticipation for an understanding of quantum mechanical effects.
Many results of modern physics such as the uncertainty relation, the quantisation, holism and the finiteness of the maximal velocity are consequences of an understanding obtained in this logic. The realisation of the cognition process in this logic offers a unified view of quantum mechanics and relativity theory.
The structure of our reality, our physical laws, can be understood as consequences of the cognition process [compare (Husserl, 1985)].

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2 A Logic for a Natural Reasoning

Classical physics is based on a logic that assigns the truth values <true> or <false> to the sentences. Many philosophers argue that this two-valued logic describes the possibilities of (human) thinking. Following the arguments given by Descartes, in the classical two valued logic the separability property holds (von Meyenn, 1990): "All effects can be understood as a result of elementary effects that are defined in points of the space." Therefore, holism that seems to be necessary in quantum mechanics, can not be understood in classical logic. The characteristic effects that distinguish quantum mechanics from classical mechanics are:

Holism: Not all effects can be described by elementary effects that are defined in points of the space.

Quantisation: A continuous transition from one state of a quantum mechanical system to its next state does not exist.

Influence of measurements: The time development of a system from time t_1 until time t_3 depends on a measurement of this system at time t_2 ($t_1 < t_2 < t_3$). The state of the system at time t_3 is independent of the realisation of the measurement, it depends only from the information obtained in this measurement.

The difficulties to understand this effects are caused by the restriction of the two valued logic. In our daily life we use a more general logic. Our knowledge is based on confirming and disconfirming arguments for future realisations of possible events.

Let E denote the set of possible future events. Our knowledge of an event $e \in E$ is defined by a knowledge-function $r: E \to [-1,1]$ with the following meaning:

$r(e) = 1$	iff the event e is sure,
$r(e) \approx< 1$	iff the event e is very likely,
$r(e) \approx 0$	iff we have no knowledge relative to e,
$r(e) \approx> -1$	iff the event e is very unlikely,
$r(e) = -1$	iff the event e is impossible.

The state S of a system is defined by all events $e \in E_S$ that are possible in this state S and a knowledge function $r: E_S \to [-1,1]$. The knowledge represented by M knowledge functions $r_1, r_2, \ldots, r_M$ can be combined by an aggregation operator Ag:

$$r(e) = Ag\big(r_1(e), r_2(e), \ldots, r_M(e)\big) \quad \text{for all } e \in E_S.$$

Aggregation operators are formally defined by Yager (Yager, 1994). The following theorem is obtained from simple calculations (Sommer, 1995):

Theorem 1: For every aggregation operator Ag, there exists a monotonously increasing scaling function $\lambda: [-1,1] \to [-\infty, \infty]$ such that for all knowledge functions $r_1, r_2, \ldots, r_M$ and all $e \in E_S$:

$$\lambda\Big(Ag\big(r_1(e), r_2(e), \ldots, r_M(e)\big)\Big) = \sum_{i=1}^{M} \lambda\big(r_i(e)\big)$$

This Theorem states: The wave function formalism of quantum mechanics is only another representation of a logic of natural reasoning. In a first step, only a real Hilbert space is obtained by Theorem 1. The combination of measurements that satisfy a conservation relation, yields the complex Hilbert space from quantum mechanics.

The value $\lambda(r(e))^2 \Big/ \sum_{e' \in E_S} \lambda(r(e'))^2$ has in quantum mechanics the meaning of the probability of the occurrence of the event $e \in E_S$. In practical reasoning this expression may be assigned to the degree of accomplishment of the event e.

Definition:(Certainty of reasons): $p(e) := \lambda(r(e))^2 \Big/ \sum_{e' \in E_S} \lambda(r(e'))^2$ is a measure for the probability or for the certainty of an event $e \in E$ in the state S of the system.

3 Anticipatory and Non-Anticipatory Knowledge Processing

Our knowledge of future events has not a uniform quality. From some contents of our knowledge future events can be deduced but other parts are not sufficiently concrete.
This difference has been noticed by Aristotle and is discussed in his famous sea battle example. Aristotle states: "It is necessary for everything that either it will take place or it will not take place, but it is not necessary that separately one of this two statements can be claimed. For example: It is necessary that < a sea battle will take place tomorrow or that the sea battle will not take place tomorrow > but it is not necessary that <a sea battle will take place tomorrow > or that < a sea battle will not take place tomorrow >."

The whole sentence: < a sea battle will take place tomorrow or a sea battle will not take place tomorrow > is true without concrete meaning of the signification of the term <sea battle>. This sentence gives us no information for further consequences whereas the sequence: < a sea battle will take place tomorrow > or <a sea battle will not take place tomorrow > makes only sense with a welldefined meaning of the term <sea battle>.

Knowledge processing in a logic of natural reasoning is different for concretised and non concretised knowledge, there exist two modes: the **anticipatory** and the **non anticipatory mode**.
From a state $S(< now >)$ and a possible state $A(t_1)$ at time $t_1 >< now >$, we obtain for the state $B(t_E)$ with $t_E > t_1$ the probability $p(B(t_E))$: by a calculation in the **non anticipatory mode**:

Schema of non anticipatory knowledge processing:

$S(< now >)$

$\Downarrow$ time development

reasons for $A(t_1)$ and <non> $A(t_1)$

$\Downarrow$ time development

reasons for $B(t_E)$

$\Downarrow$ Aggregation (measurement)

(3.1) $$p(B(t_E)) = p(B(t_E)/S < now >),$$

and by a calculation in the **anticipatory mode** :

Schema of anticipatory knowledge processing:

$$
\begin{array}{ccc}
 & S(<\text{now}>) & \\
 & \Downarrow \text{ time development} & \\
\text{reasons for } A(t_1) \text{ and} & & \text{reasons for <non>} A(t_1) \\
\Downarrow & \text{Aggregation (measurement)} & \Downarrow \\
p(A(t_1)/S<\text{now}>) & & p(<\text{non}>A(t_1)/S<\text{now}>) \\
\Downarrow & \text{time development} & \Downarrow \\
\text{reasons for } B(t_E) \text{ and} & & \text{reasons for } B(t_E) \\
\Downarrow & \text{Aggregation (measurement)} & \Downarrow \\
p(B(t_E)/A(t_1)) & & p(B(t_E)/<\text{non}>A(t_1)) \\
 & \Downarrow &
\end{array}
$$

(3.2) $$p(B(t_E)) = p(B(t_E)/A(t_1)) \cdot p(A(t_1)/S<\text{now}>) + \\ + p(B(t_E)/<\text{non}>A(t_1)) \cdot p(<\text{non}>A(t_1)/S<\text{now}>)$$

The two expressions (3.1) and (3.2) are in general different.

The following Lemmas are deduced from the logic of reasoning.

Lemma 1: In a knowledge deduced from a great quantity of reasons, the two valued (classical) logic holds.

Sketch of the proof:

Let $r_i \ (i = 1,\dots,M)$ denote a set of reasons for an event $e \in E$, defined by the values of wave functions $\psi_i(e) := \lambda(r_i(e))$.

The knowledge obtained from all these reasons $r_i(e) \ (i = 1,\dots,M)$ is represented by the wave function: $\psi_g(e) := \sum_{i=1}^{M} \psi_i(e)$

We are interested in the values $\psi_g(e)$ that generally will be expected. As there is no information available of the values $\psi_i(e)$, we assume that in the average this values are normally distributed with expectation 0 and variance σ_i.

From probability theory (Pagachev, 1973) we obtain that the value $\psi_g(e)$ is also normally distributed with expectation value 0 and variance σ_g and

$$\sigma_g \to \infty \quad \text{holds for } M \to \infty.$$

For $M \to \infty$, the distribution of $\psi_g(e)$ is therefore approximated by an equidistribution.

As shown in Figure 1, the inverse mapping of λ, λ^{-1} transforms an equidistribution with high probability into the two truth values -1 (for no) and +1 (for yes).
For many reasons it is therefore most probably to obtain the two valued logic.

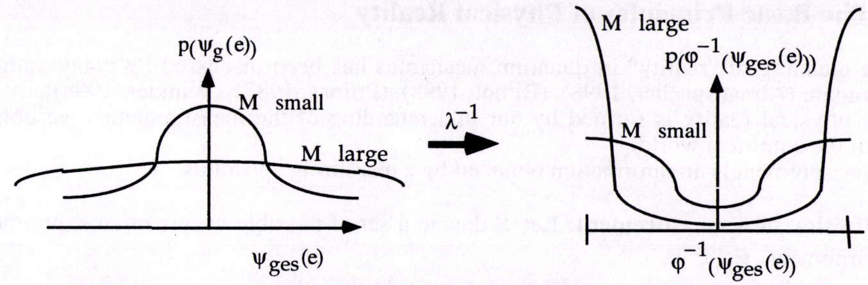

Figure 1: Knowledge obtained by many reasons in the wave function formalism and in the Fuzzy formalism. $p(w)$ denotes the probability distribution of the value w.

Lemma 2: The complexity of a knowledge base is greater if this knowledge is processed in the anticipatory mode than in the non anticipatory mode.

Proof:

Let $r_i : E \to [-1,1]$ $i = 1,2$ denote two reasons for an event $e \in E$. Two possibilities exist: r_1 may be a confirmation of r_2 or a contradiction with r_2.

In the case of a confirmation we obtain:

$$\begin{aligned} \mathrm{Ag}\big(\lambda(r_1(e) \vee r_2(e))\big)^2 &= \big(\lambda(r_1(e)) + \lambda(r_2(e))\big)^2 \qquad \text{for } \mathrm{sgn}(\lambda(r_1(e)))=\mathrm{sgn}(\lambda(r_2(e))) \\ &= \lambda(r_1(e))^2 + 2\lambda(r_1(e))\cdot\lambda(r_2(e)) + \lambda(r_2(e))^2 \\ &> \\ &= \lambda(r_1(e))^2 + \lambda(r_2(e))^2 = \mathrm{Ag}(\lambda(r_1(e)))^2 + \mathrm{Ag}(\lambda(r_2(e)))^2 \end{aligned}$$

and in the case of a contradiction follows:

$$\begin{aligned} \mathrm{Ag}\big(\lambda(r_1(e) \vee r_2(e))\big)^2 &= \big(\lambda(r_1(e)) + \lambda(r_2(e))\big)^2 \qquad \text{for } \mathrm{sgn}(\lambda(r_1(e)))=-\mathrm{sgn}(\lambda(r_2(e))) \\ &= \lambda(r_1(e))^2 + 2\lambda(r_1(e))\cdot\lambda(r_2(e)) + \lambda(r_2(e))^2 \\ &< \\ &= \lambda(r_1(e))^2 + \lambda(r_2(e))^2 = \mathrm{Ag}(\lambda(r_1(e)))^2 + \mathrm{Ag}(\lambda(r_2(e)))^2 \end{aligned}$$

These equations state:

In the case of confirmation, the non anticipatory knowledge processing provides more certainty than the anticipatory processing and in the other case of a contradiction, the non anticipatory knowledge processing provides less certainty than the anticipatory processing.

The non anticipatory knowledge processing provides therefore a clearer decision than the anticipatory processing.

Since for a definite description less information (in the sense of information theory) is needed than for a indefinite description, which allows many possibilities, the statement of Lemma 2 has been proved.

4 The Basic Principles of Physical Reality

The meaning of "reality" in quantum mechanics has been discussed by many authors [compare (Atmanspacher, 1998), (Bitbol, 1998), (Primas, 1987), (Winkler, 1998)].
Our physical reality is formed by our understanding of the measurements, we obtain from the empirical world.
A measurement is an information obtained by a measuring apparatus.

Definition of a measurement: Let E denote a set of possible events in an experiment environment, $E_m \subset E$.
A **measuring apparatus** provides the information:
>>an event of E_m has occurred<< or >>no event of E_m has occurred<<.
The information obtained from a measuring apparatus is called **measurement**.

Cognition means: The identification of the "best" description of a set of measurements in our logic.

Using the **Ockham razor principle**: The "best" description is the shortest description that corresponds to the measurements up to some accepted measurement errors.

Our logic is therefore a presupposition of our cognition process. The restrictions of our logic will reappear as prejudices in our cognition process. An example of such a prejudice is the separability principle that Descartes deduced from classical logic. This principle does not claim that any physical element (including atoms and quarks) can be separated into parts but only that this separation should be thinkable. As is seen from a discussion of the famous Einstein Podolski Rosen Paper, also the thinkability of the separation principle impedes the understanding of many phenomena in quantum mechanics [compare (Penrose, 1995)].
We recommend therefore in this article a more general logic, for an understanding of quantum mechanical effects that does not imply this supposition. It will be shown that many results of modern physics, the uncertainty principle, the quantisation, the finiteness of the maximal velocity in our world and many other effects are consequences of the description of the empirical data in the logic of natural reasoning.
Our reality is formed by the ordering we assign to the empirical data with our logic.

Another principle that has been detected by Albert Einstein states:
Einsteins Principle: Every cognition has to be based on empirical reasons. Or if we can not distinguish between two experimental environments then necessarily, in these environments the same physical laws hold.

The basic physical ideas are defined by ordering principles of the empirical data.

4.1 Time ordering:

Two time instants t_1 and t_2 are neighbouring in some region of the space, if it is difficult to distinguish between the measurements in t_1 and in t_2. Time is the ordering of our empirical data that maximises our possibility to make forecasts in our reality (Sommer 1998).

4.2 Space and distance:

In the logic of natural reasoning, it is impossible to define distance by putting a measure against two places in the space, because in a knowledge that is restricted on reasons for physical facts, fixed endpoints of a measure do not exist. We have to introduce another definition for the distance between two places in the space:

Definition of a distance: The distance between two places A and B in the space is defined by the degree of distinguisability between the measured data in the place A and in the place B.

Indistinguishable places form **a point in the space**.

(Distinguisability is a well defined concept in Fuzzy logic [compare (Sommer, 1997)]. By rescaling, the distance dist(A,B) can be defined so that for a place C on the shortest path from A to B holds: dist(A,C) + dist(C,B) = dist(A,B) .)

Lemma 3: The perceptibility of an entity from the place A in the place B depends on the distance between A and B.

Proof:

The distance between the places A and B is partitioned into n sections $\overline{AA_1}, \overline{A_1A_2}, \ldots \overline{A_{n-1}B}$ of an equal degree of distinguisability. By the Einstein principle, the perceptibility of on entity from A_{i-1} in A_i is the same task for every section and has therefore the same difficulty. The difficulty of the perception of an entity from A in B depends therefore on the number n of sections between A and B or on the distance of $\overline{AB}$.

4.3 Elementary entities:

A state of an object is defined by the set of all measurements $\psi(t, r)$ we can make from this object at the time instant t in the space point r. Elementary entities are defined as objects in our description language that allow a simple description. An entity is therefore composed, if its description can be decomposed into a sum of simpler parts. An entity is "by itself", if its description is independent from its environment. The time development of this entities is characterised by the Schrödinger equation (Sommer 1997).

$$\frac{d}{dt}\psi(t,r) = H\psi(t,r) \qquad (H = \frac{-i}{h}\cdot\hat{H} \text{ where } \hat{H} \text{ is denoted Hamilton-operator.})$$

4.4 Holism:

Esfeld defines a holistic system (Esfeld, 1999): "A system is called holistic, if the local properties do not determine the system completely." Our universe is called holistic if it contains holistic subsystems. This means, with the definitions of section 4, the existence of elementary entities that are not concentrated into a point of the space. It is than impossible, to base a description of the world on mass points.

5 The Structure of Reality Deduced from the Process of Cognition

In this section, we deduce the consequences from the principles given in the preceding sections.

5.1 The Uncertainty Principle:

Lemma 3 states that by measurements which change our knowledge processing from the non anticipatory mode to the anticipatory mode, the complexity of our reality is increased. Our knowledge is therefore more uncertain or decreased.

A very astonishing result from quantum mechanics is the fact, that the disturbance of our knowledge by a measurement is independent from its realisation, and that in some situations the lost knowledge will be received back, if we delete the information of the measurement (the quantum mechanical rubber). In classical physics, our measurements also disturb the behaviour of the measured objects, but afterwards this disturbance can not be made undone and the disturbance depends strongly on the realisation of the measurement. In principle, it is thinkable to make measurements without any disturbances. Corollary 1 shows the totally different situation in quantum mechanics:

Corollary 1 (Uncertainty Principle): The knowledge over the time development of a system is reduced by measurements in dependence of the measurement information. It is not thinkable to make measurements without any disturbances.

Proof:

Compare Figure 2, where the knowledge transfer to the point r at time $t+\Delta t$ is shown, with and without the measurement >>$e \in E_m$ at time t ?<<.

By the measurement >>$e \in E_m$ at time t ?<<, the knowledge received at the point r at time $t+\Delta t$ is reduced by a uniquely determined quantity:

>>the information coming from $E - E_m$ at time t to r at time $t+\Delta t$<<.

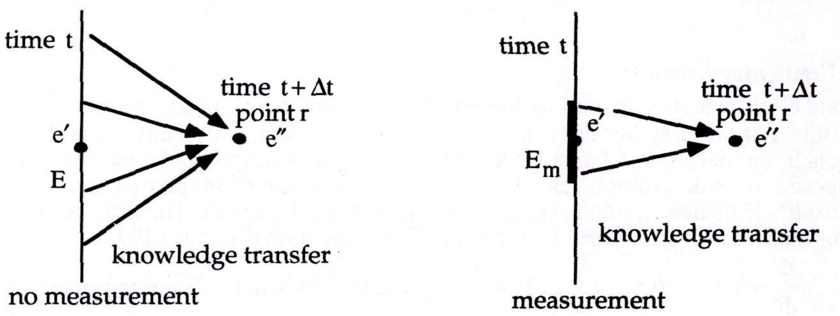

Figure 2: The knowledge transfer to the point r at time $t+\Delta t$, with and without measurement at time t.

5.2 Quantisation and Holism:

Lemma 1 states that a great quantity of reasons is transformed into a knowledge that can be described in the two valued logic. Therefore in a reality that can not be understood in a two valued logic, situations must exist that allow only a description with a small set of reasons. With the elements of this small set, it is impossible to formalise a continuos transformation of one configuration (defined by some of the reasons) into another configuration (defined by some other elements of the set of reasons). If it is necessary to describe our reality in the logic of natural reasoning, then quantisation effects must exist.

The necessity to distinguish between an anticipatory and a non anticipatory processing of our information implies the holism of our reality. This is easily deduced from an explication of the famous double slot experiment (compare Figure 3).

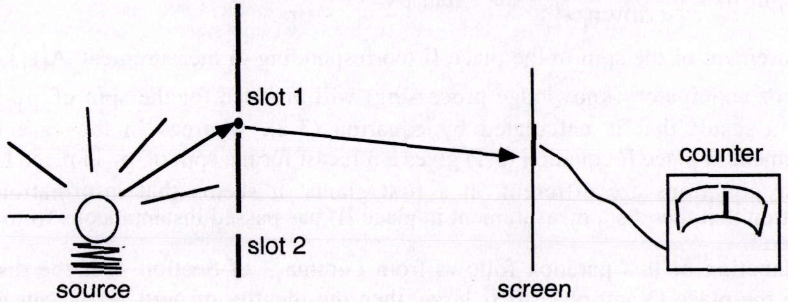

Figure 3: The double slot experiment.

The measurement on the screen without a measurement in slot 2 will be forecasted by equation (3.1) (for the non anticipatory case) and with a measurement in slot 2 by equation (3.2) (for the anticipatory case) also if the particle is passing through slot 1.
We note therefore an influence from slot 2 for a particle passing through slot 1. A result that forces us to accept holism in our reality.

5.3 The Einstein Podolski Rosen (EPR)-Experiment:
The **Principle of Einstein Separability** states:
The information of an effect in a place A can not arrive in a place B faster than in the time period $\overline{AB}/c$, where c is the velocity of light.
The transmission of an information from one place A to another place B can not be instantaneous.

This principle is a presupposition for the definition of time given in Section 4. An instantaneous transmission of information would destroy the order of time instants claimed for the definition of the time order.

A schema for the mostly given realisation of the EPR-experiment is given in Figure 4.

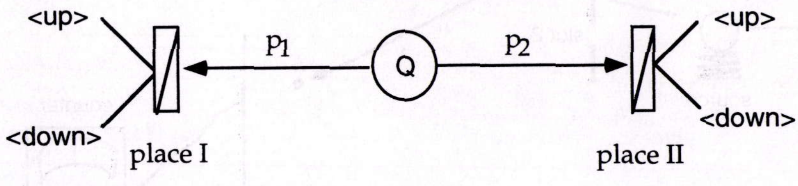

Figure 4: The Einstein Podolski Rosen Experiment.

A pair of particles (p_1, p_2) with spin 0 separates in the place Q into two parts p_1 and p_2 where one part has spin <up> and the other spin <down>. Particle p_1 is flying to place I and the other particle p_2 to place II. Because of the conservation of the spin, the following relation holds:

$$(5.1) \quad \text{spin } p_1 = \left\{ \begin{matrix} <\text{up}> \\ <\text{down}> \end{matrix} \right\} \quad \Leftrightarrow \quad \text{spin } p_2 = \left\{ \begin{matrix} <\text{down}> \\ <\text{up}> \end{matrix} \right\}.$$

A measurement of the spin in the place II (corresponding to measurement $A(t_1)$ in the schema of anticipatory knowledge processing) will produce for the spin of p_1 in the place I a result that is calculated by equation (3.2), whereas in the case of no measurement in place II equation (3.1) gives a forecast for the spin of p_1 in place I.

As these equations are different, at a first glance it seems that information (the information that there is a measurement in place II) has passed instantaneous from place II to place I.

An explanation of this paradox follows from Lemma 3 of Section 4. If the distance between the place Q and place II is large, then the identity of particle p_2 can not be guaranteed in place II and we cannot realise the anticipatory mode. Our definition of distances is decisive in this explication. If the environment of Q consists (in the classical sense) of a large empty region (an absolute vacuum) where no other particle may disturb the measuring in the place II then in our definition of distances, every distance in this region will be small.

5.4 The uncertainty of time:

A slightly different realisation of the EPR-experiment shows the uncertainty of time (compare Figure 5).

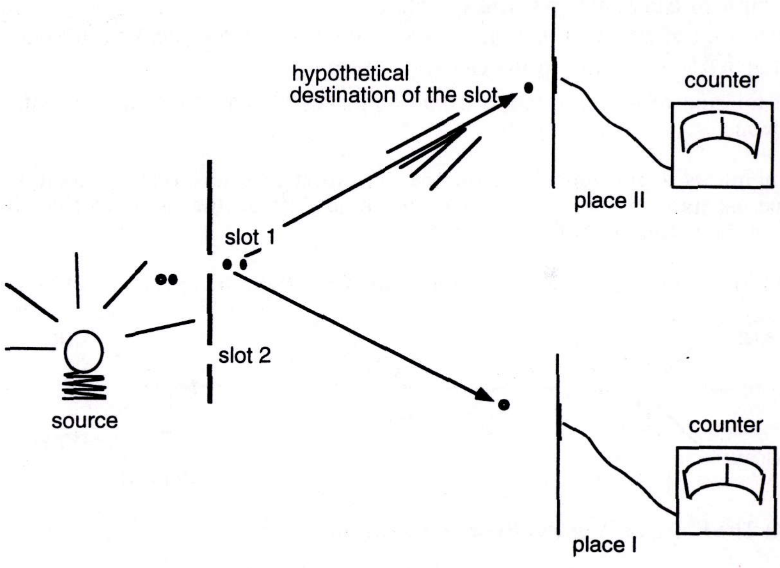

Figure 5: An alternative hypothetical realisation of the Einstein Podolski Rosen Experiment.

A pair of particles (p_1, p_2) passes one of the two slots at the place Q and one part p_1 flies to the screen in place I and the other p_2 to the screen in place II.
If we distinguish in a subsequent measurement in place II between the path through slot 1 and through slot 2, then this would mean that the concretisation of the information of the slot where the pair had passed (and by this means the selection between the equation (3.1) and (3.2)), could be made some time period later after the event (the pair passes through the slots) had occurred. This would imply that the ordering of events in the time order is impossible. For small distances however, where the realisation of a destination of the slot in place II is not excluded, the time order is undefined.

5.5 Some results from Relativity theory:
As we have not fixed in this article, the scaling for the length and time measurements, only qualitative results can be given.

Corollary 2 (Contraction of distances for a moving observer): The distance between two places A and B is shorter for a (relatively to A and B) moving observer than for a fixed observer.
Proof
We discuss the difference between the observation of an observer O_m that is moved relative to A, B with velocity v and a relatively to A, B fixed observer O_f. Because of the uncertainty relation (Corollary 1) the information of the places A and B is reduced for O_m. It is therefore more difficult for this observer O_m to distinguish A, B from other places of its environment than for O_f. The environments of places that can not be distinguished from A and B are therefore greater for O_m than for O_f. Following the arguments given in the proof of Lemma 3, we note that the distance between A and B is for O_m shorter than for O_f.

Our world will be called finite, if the distance between any two objects is bounded by a fixed value $d < \infty$. (A world that had been created by a big bang is finite due to the Principle of Einstein Separability.)
Corollary 3 (Finiteness of the velocity of light): For every observer in a finite world exists a finite maximal velocity. This velocity is called the velocity of light c.
Proof
Let O_m denote an observer that is moved with velocity v relative to places A, B in the space. If A is very near to B, then by Corollary 2, O_m can not distinguish between this places. If there exist a maximal distance d in our world, then by the Einstein Principle for a velocity v_{max} with $\frac{v}{\overline{AB}} \leq \frac{v_{max}}{d}$ or $v_{max} \leq \frac{v}{\overline{AB}} \cdot d$,

an observer O_{max} moving with the velocity v_{max} can not distinguish between any two places in the world. This velocity is therefore maximal and as $\frac{v}{\overline{AB}} \cdot d$ is finite, we have deduced that $v_{max} := \frac{v}{\overline{AB}} \cdot d$ is also finite.

Corollary 4 (Theorem of P. Dirac): In an expanding universe, the maximal velocity increases.

Proof

The relation $v_{max} = \frac{v}{\overline{AB}} \cdot d = k \cdot d$ from the proof of Corollary 3 shows Corollary 4.

Remark: The increase of the velocity of light is a possible explanation for the acceleration of the expansion of the universe. If the velocity of light c had been smaller in earlier states of the world, our estimate of distances we deduce with the assumption of a canstant value for c would feigen us greater distances and perhaps an acceleration of the velocity of the expansion.

6 Conclusions

The formalism of quantum mechaniques [compare (Fick, 1983) and (Hejna & Vajda, 1999)] had been deduced from the cognition process with a logic of natural reasoning. It had been demonstrated that anticipation is not a property only related to living - it is also a quantum phenomenon.

The discussion of some effects in modern physics confirms the position of Niels Bohr, that modern physics realy needs new methods of thinking and not only a revision of our understanding in classical logic. (Bohr, 1958):" In quantum mechanics we are not dealing with an arbitrary renunciation of a more detailed analysis of atomic phenomena, but with a recognition that such an analysis is in principle excluded." (Bohr, 1963) " This is because any consistent use of the concept of quantum of action refers to phenomena resisting such an analysis."

It was the idea of Daniel Dubois and Philippe Sabatier (Dubois & Sabatier, 1998) to base this new method of thinking on a naturalist reasoning. The reasoning of early cultures is not adapted to the advances of our modern sciences and can therefore avoid the restrictions of classical logic.

Our main result is: To be free from prejudices, our knowledge had to be deduced from the measurements with a logic that is as general as possible.

Cognition means the deduction of explications from the measurements in the most general logic.

In this view only a very weak rationality can be assigned to our observations. Their apparence is mostly destinated by our method of understanding. We have obtained a view of reality that is very close to the famous work of Edmund Husserl (Husserl, 1985). [For alternatives, compare (Carnap, 1986) and (Thiel, 1996).] In our opinion this method is very fruitful for an understanding in social sciences. A beginning in this direction is the effort to explain in the logic of natural reasoning some results of the seminal book "Escape from freedom" from Erich Fromm [(Fromm, 1983), (Sommer, 1999)].

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