

# A world with retroactive causation

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## Abstract

Physical laws are inherently time symmetric. It is generally assumed that the fact that we experience only one direction of time development is related to constraints like those imposed on the universe at the time of the 'big bang'. The unilateral time direction is directly related to human perception of 'causality'. A cause precedes its effect. In the paper the consequences of a less restricted view on time are discussed. It is argued that

- a) there is empirical evidence that effects can precede causes (or more precisely: that distributions of chance events might be biased contingent on future context) ,
- b) there is no necessary logical paradox related to these phenomena, c
- c) that these findings might be interpreted as an extension of the recent interpretation of Quantum Physics but d) that the implications are far-reaching in as far the western scientific paradigm is concerned.

## 1. Introduction

Hansel (Hansel, 1966 and 1980), the most famous critic of the field of Parapsychology, stated that

*...paranormal phenomena like telepathy, precognition and psychokinesis do not exist because they can't exist .....*

Although this statement seems scientifically naive it is certainly held by a large percentage of the scientific community. A world with those phenomena is thought to be an **impossible** world. It is interesting to note that field studies indicate that general people have a considerable different world view. As we will see in the sequel this difference might be brought about by the fact that these phenomena not merely question the validity of classical physical models but undermine the basic premisses of the accepted scientific paradigm.

## 2. The phenomena

### 2.1 Historical background and definition

Ever since the beginning of modern history, phenomena have been reported that in the light

of modern science appear to be inexplicable. In the antiquities political society was partly based upon information obtained through the oracle of Delphi. In modern terminology it concerned precognitive information because questions generally were concerned with the unknown future. Similarly the writings of Nostradamus have been interpreted as forecasts of an unknown future. Other reported phenomena, e.g. in relation with Jesus Christ, concern miraculous healings and 'impossible' physical phenomena like levitation. In the field of modern Parapsychology these phenomena are labeled as Psychokinesis or Mind over Matter. Although incidently early 'scientific' reports concerning these phenomena appeared (eg. by Hume, generally considered to be the founder of modern science) the first regular reports appear near the end of the previous century and mark essentially the beginning of the systematic and scientific field investigations of these so-called psi phenomena. From the thirties on also empirical laboratory studies have been done.

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insert fig.1 about here

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In figure 1 the three categories of psi phenomane are defined using the concept of information<sup>1</sup> as a crucial element.

## **2.2 The reality issue**

The question about the mere reality of these phenomena has triggered many furious debates. The present situation seems to be that most scientists (fig.2) just ignore this question because an affirmative or an denying answer would not make much difference.

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insert fig.2 about here

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Their position can best be characterized with the statement *...even when some of the phenomena are real they are too seldom to pay attention to ...* However there is a vigilant minority in the scientific community who attack wherever possible the claims of the paranormal. Research findings in the field of Parapsychology are explained away by the hypothesis of poor research and or subject /experimenter fraud. On the other side an important fraction of the Parapsychological researchers are inspired by a (quasi) religious background and behave similarly as true 'believers'. Their focus is on 'proving the existence' of psi-phenomena. In this quest their main problem is the notorious elusiveness of the phenomena. As the sceptic says: for an empirical phenomena to be real it should be

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<sup>1</sup>Psychokinesis can be seen as the tranfer of information since the resulting phenomena can be described as biases of an otherwise normal probability distribution. The 'mechanism' by which this information is transferred however is unidentified and it remains to be seen if energy is involved in the process.

reproducible. The reality issue has turned into a debate about the replicability of the phenomena. This debate is not yet concluded with a clear-cut victory of one of the two camps. However Meta analysis of empirical research (Hyman and Honorton, 1986 & Radin and Nelson, 1987) tends to validate the claim that the phenomena are replicable to some degree.

Apart from these two extreme near religious positions there is a group of researchers who, on the basis of the present empirical evidence, consider it worthwhile to do some more process oriented research. In the last 15 years or so, this group succeeded to formulate a unified theory. Empirical work suggested by these theories was initiated. The unified framework hinges strongly on an alternate view on time and has its roots in Bell's theorem (Bell, 1969) which made the idea of non-locality empirically falsifiable.

### **3. The theoretical background**

Until recently there have been no serious theories that could account for the psi phenomena. In the thirties, while most emphasis was given to telepathy or 'thought transfer', the model of Mental Radio was rather popular. Upton Sinclair even wrote a book with that title and introduced by Einstein. The idea was that electromagnetic radiation could be emitted by one brain and received by another brain. It was clear from the beginning, however, that this model could not account for phenomena like psychokinesis and precognition unless energy conservation law violation and/or time direction violation were allowed. Other models based upon classical physics have been proposed but without any exception they could not account for all three classes of phenomena (Bierman, 1985)

#### **3.1 Quantum Physics**

In 1972 the physicist Walker (see Walker, 1975) proposed that psi phenomena should be explained by an, in his opinion, rather natural extension to Quantum Physics. The origins of the debate about the interpretation of the Quantum Formalism can be traced back as far as 1935, when the famous Einstein-Podolsky-Rosen thought experiment was proposed. The main point made by this thought-experiment was that, since from a measurement on one part of the system the outcome of a measurement on another remotely located part could be predicted (through perfect correlation) this should indicate that the status of this second part was a physical reality also **before** the measurement. This seems obvious but Quantum Physics provided no basis for a description for this reality (see figure 3).

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Insert fig.3 about here

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It took more than 30 years before someone realized that this discussion on the measurement problem might have implications for paranormal phenomena. The reason for this delay must

be found in the idea that some physicists, most notably Einstein, believed that Quantum Physics was not yet a complete theory and that the measurement problem could be solved by adding something to this formalism. Einstein eg. believed that addition of some (hidden) parameters in the quantum formalism might account for the supposed reality of states before measurement. Anyway the discussion was thought to be metaphysical and hence it disappeared from the focus of attention of the physical community. Until in 1969 the CERN physicist Bell proved that the completeness of Quantum physics could be tested empirically. Actually even at that moment some experiments had been done which strongly suggested that Quantum Physics was complete which implies that a system after preparation but before measurement does not have definite values for its observables.

### **3.2 Unified psi-theory**

When it was realized that the physical reality before and after measurement, according to the generally accepted physical theory, was different, a number of people suggested that it must be consciousness that brings about this change (Wigner, 1962). Walker proposed that this process which has been labeled 'the collapse of the state vector' was not a purely passive process with information flowing from the measured system to consciousness but also with information flowing from consciousness into the observed system (figure 4).

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Insert fig.4 about here

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It should be stressed that this latter proposition is completely outside accepted Quantum Physics and has raised objections from inside the community of theoretical physicists.

Since the observation<sup>2</sup> of the outcome of an experiment plays a crucial role in this theory, it

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<sup>2</sup>What constitutes an observation is still a matter of debate. Some empirical work has been done to investigate the effect of information specificity and amount of information. Also 'meaningfulness' which might be operationalized as the amount of information which can be used for a subsequent action might be a relevant factor describing the act of observation.

has been labeled the Observational Theory. This theory describes the psi phenomenon as a two step process. The first step consists of random events while the second step is the observation of the outcome which might bias the probability distribution which is normal for these random events. Figure 5 shows schematically how each of the psi-phenomena is treated within this framework.

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Insert fig.5 about here

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The basic events which are biased in the case of telepathy, clairvoyance and precognition are the random brain processes that underlie the guesses or protocols produced by the subject. For psychokinesis (PK) the basic singular event is of course a fundamental random physical process (eg. the decay of a radioactive atom). The second part of the psi process is the observation of the result. For the traditional psi phenomena like clairvoyance and telepathy this observation always occurs later than the primary random event since it involves the comparison of the guess with the target. In precognition this delay might be considerable. In psychokinesis the feedback of the result might be instantaneous or artificially delayed. The random events are thought to be constrained by this future condition of feedback and therefore biased probability distributions might occur.

On the basis of these considerations it was predicted that PK must be possible on prerecorded random events. This prediction was first tested in the Netherlands (Bierman & Houtkooper, 1975) and later by Schmidt in the USA (1976). The prediction was confirmed.

### **3.3 Possible or impossible world**

The question whether the world with paranormal phenomena is an impossible one, as is often claimed by the sceptic, can be upheveled from the empirical level to the theoretical. Then the question is whether the Observational theories provide a logical consistent theoretical framework.

A few physicists have vigorously objected to the proclaimed role of consciousness in the collapse of the state vector (Wheeler, 1981). They claim that not consciousness but certain aspects of the measurement device should be held responsible for this collapse. The apparatus would induce irreversible processes since it has to obey the second law of thermodynamics.

Several objections can be put forward against this conjecture. According to von Neumann (von Neumann, 1955) the measurement device is just a quantum mechanical system and should not be treated differently. Furthermore one could suspect that the basis of the 2nd law of thermodynamics is formed by the collapse of the state vector. Therefore it would be

logically inconsistent to use this law again to explain this collapse. Finally it has been suggested that the second law is rooted in the singular boundary condition at the time of the big bang. Physics is free to incorporate also boundary conditions in the future (eg. the contraction of the universe which has to occur according to some theories about the universe). If these are taken into account, the second law has to be modified. So it appears that, theoretically, there are no clear cut objections against incorporation of Consciousness in the framework of Quantum Physics.

However this is not the whole story. As stated before, the act of observation is not considered to be a passive process leaving unaffected the Quantum mechanically predicted probability distributions. Information is supposed to 'flow' from the observer into the system. It is this transfer of information that causes biases. Thus very improbable outcomes might occur more often than according to Quantum Mechanical predictions might be expected. Braude (1979), a philosopher of science, has stated that this implies a logical paradox. Because, what is caused (the improbable observed outcome) is the effect of itself (the observation). This apparent paradox is caused by a failure to grasp the statistical nature of the process. As Schmidt showed (Schmidt, 1976) in a brilliant article with the title *Can effect precede its cause?* it is possible to create a simple and consistent mathematical formalism for systems that are not only constrained by past but also by future conditions. However this is only possible if one refrains from singular events and only considers stochastic ensembles (group of similarly prepared events). Thus the logical paradox, which might be related to the intervention paradox (avoiding a predicted event), is shown to be non-existent. To illustrate this thinking in probabilistic rather than in singular terms one could compare the process in which a audio-system with no input produces white noise (a rather flat probability distribution of frequencies) when the speaker provides no feed-back. The audio-system gets completely different properties when the speaker output is fed back to the input of the system (figure 6).

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Insert fig.6 about here

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The conclusion of these theoretical considerations might therefore be that there are no reasons to exclude a world with psi from the set of possible worlds.

#### **4. The premisses of a Natural World View**

In this chapter I show the consequences for western science if a world with psi exists. Many

scientists believe that science constitutes a system without assumptions. This is however not the case. Its assumptions are intuitively very plausible and consistent with what has been called a "natural world view". There are basically 3 premisses (d'Espagnat, 1979) which, I am afraid, are not quite independent (fig.7).

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insert fig. 7 about here

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#### **4.1 Locality**

This assumption, also called separability, states that no information exchange is possible between systems which are at infinite distance. This enables us to create more or less isolated systems in physics, anyway isolated to such a degree that outside interactions can be neglected. Similarly it is assumed in Psychological experimentation that less uncontrolled information is exchanged between an experimenter and a subject if the experimenter stays at a large distance from the subject (and uses eg. tapes for instruction). In a discussion of the Measurement Problem, d'Espagnat (d'Espagnat, 1979) concludes that the simplest way to account for the correlation between systems that have interacted in the past and which are so far apart that they can not exchange information by (light) waves, is to accept non-locality. According to d'Espagnat, by accepting non-locality, the other premisses which so heavily determine our world view can be preserved. It should be emphasized that the information transfer which is allowed here cannot be used for sending messages. The information transfer does not reflect itself in biased probability distribution but merely in the fact that we do not experience a statevector (a mixture of all possible results of an event) but a singular value thereby enforcing the required correlations.

#### **4.2 Induction**

The second assumption which is especially important with regard to scientific methodology is the assumption that induction is a valid method for inference. Thus if we have established that a specifically prepared system under a certain treatment produces 100 times a specific outcome, we might induce that the probability to expect the same outcome in the next experiment is about 100 times larger than any other outcome. Of course this induction relies heavily upon independence between successive measurements. At first sight independence is hardly guaranteed if we accept for non-locality. However given the admitted restricted type of info in this non-local transfer, the measurements are not necessarily less independent. However true as this might be for a world with passive consciousness, this is certainly not true for a world in which consciousness is able to transfer information in a system. The essential problem here is that no specific mechanism is specified and hence there seems to be no way to 'shield' the dependency of one experiment on the other. In the

above mentioned paper of Schmidt it is shown that if one allows for uncontrolled sources (he talks about sources where I specify these as the interaction with a conscious observer) each experiment is dependent on the next experiment. Independence can only be guaranteed if the results of an experiment are destroyed after the experiment and before publication. Thus a world with psi seems to undermine the foundations of statistics.

### **5.3. Objectivity**

The third assumption which is one of the dogma's of the scientific "church" is the assumption that reality exists independent from the human observer. Any regularities found in nature are inherent to nature and experimenter A must be able to establish this reality like experimenter B and C. This 'objectivity' is certainly not attacked through non-locality. However in a world where effects can be constrained by the future state of consciousness of the experimenter, regularities might be a reflection of this state rather than of a intrinsic property of nature. It has been suggested that the laws of nature might change gradually if our expectations about them change.

### **6. Conclusion**

Although a world with psi seems not to be an impossible world, it is certainly a world which implies that western scientific methodology should be revised if one wants to bring this reality under scientific scrutiny. It might be that this state of affairs is intuitively grasped by the majority of the scientific community which might explain the antagonistic attitude of this majority.

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