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Arguing for an Observational Theory of Paranormal Phenomena

Joop M. Houtkooper

Centre for Psychobiology and Behavioral Medicine at the Justus-Liebig-University of Giessen, Otto-Behaghel-Strasse 10, D-35394 Giessen, Germany
e-mail: joop.m.houtkooper@psychol.uni-giessen.de

Abstract—The problem of devising a theory for paranormal phenomena (psi) may be separated into, first, the basic physical mechanism and second, the psychological aspects of how and when people are able to elicit psi.

Observational theory addresses primarily the first aspect, the basic physical mechanism of psi. A problem is that the known types of physical interaction do not fit the existing data.

The measurement problem in quantum mechanics can be used to hypothesize an observer who adds information at the collapse of the wave function. For each random event one of the possible outcomes becomes realized as the event is being observed. The basic tenet of observational theory is: the statistics of single events become biased if the observer is motivated and prefers one of the possible outcomes over the other.

Features of observational theory are: its predictive power, proven with regard to retroactive psychokinesis (PK); parsimony: the same mechanism explains ESP as well as PK; fruitfulness, as there is a direct relationship with quantum mechanics; and openness to crucial experiments. The falsifiability criterion poses some problems: these are discussed in relation to Lakatos' methodology of research programmes.

Observational theory is a solution to the problem of the mediation of psi, thus providing a framework for the psychological problem of the manifestation of psi. Henceforth, the observation of the outcome should be regarded as formal part of parapsychological experiments. There is reason for cautious, patient optimism about the acceptance of observational theory.

Keywords: observational theory — parapsychology — quantum mechanics — non-locality — causality violation — precognition — psychokinesis — philosophy of science

Introduction

Since the early 1970's, an approach to the theory of paranormal phenomena has been developed, which has become known as "observational theory". What, then, is observational theory? As I will show, it is an attempt to explain the basic mechanism of the paranormal phenomena, that is, telepathy, clairvoyance, precognition (collectively called ESP) and psychokinesis (PK). The generic term for these phenomena, psi, hitherto has been a collective term without a clear basis. Observational theory, however, does provide a theoretical basis for the use of this term. Observational theory can best be characterized by its 'central axiom': "The act of observation by a motivated observer of an event with a quantum mechanically uncertain outcome influences that outcome".

For the explanation of psi, observational theory draws upon the 'measurement problem' in quantum mechanics. This will be outlined in detail, but first the general problem of a theory of paranormal phenomena is considered.

Theoretical Parapsychology

Paranormal phenomena have puzzled many scientists and therefore it is not surprising that the literature is replete with theories of paranormal phenomena. Parapsychological theories have been reviewed comprehensively by Stokes (1987), who categorizes the multitude of theories that have been proposed since the early 20th century. Apart from discussing observational theory, Stokes mentions, for instance, electromagnetic theories, space-time theories, neuropsychological theories and theories based upon mind-brain dualism. These theories are accompanied by the problems they entail, such as the coding-decoding problem when considering electromagnetic radiation as the medium for transfer of information in ESP. All theories are attempts to explain the occurrence of certain aspects of paranormal phenomena, that is, theories are of varying scope and of varying merits.

This article is concerned with observational theory, about which I hope to make clear that this theory provides insight in a mechanism which can explain all categories of paranormal phenomena in way that has a certain relationship with present day physics. Although observational theory deals mainly with the physical aspects of psi, it may provide a way to come to a comprehensive theory of paranormal phenomena, phenomena which then will no longer belong to the catogory of the 'anomalous'.

For the understanding of the problems parapsychology is concerned with, the distinction made by Irwin (1994) is revealing. Irwin distinguishes two theoretical problems:

1. How are psi phenomena at all possible? This is called the problem of the mediation of psi, or the physical problem of psi.
2. How are people able to produce psi phenomena? This is called the problem of the manifestation of psi, or the psychological problem of paranormal phenomena.

One reason why progress in parapsychology has been so slow may well be that the one problem cannot be solved without at least a fair idea of the other. Therefore, observational theory may serve as a catalyst, even if it is incomplete in the sense that not all of the problems it entails have been solved.

The purpose of this article is to show what the fruitful aspects of observational theory are—and where it could be more useful if observational theory is further developed.

Physics and Psi

About Physics and Psi

In the prevalent view, physics leaves little room for paranormal phenomena. My present objective is to make the most of the room there is within established physics, instead of invoking completely new principles.

To grasp the difficulty of understanding psi within the framework of physics, take for instance precognition: A future event that cannot be inferred from present knowledge, such as an event produced by a random generator (RNG), is predicted by a person. No physical interaction (electromagnetic, weak, strong nuclear, or gravitational) appears to be able to explain the foreknowledge of such a future event, which is fundamentally random and to our normal understanding unpredictable. Even within parapsychology the phenomenon of precognition has met with considerable skepticism: see, for instance, Steinkamp (1999).

As it is not excluded by the laws of physics that future events produce their traces in the present, attempts have been made to explain precognition within physics, for instance, by invoking advanced-wave solutions of the Maxwell equations, but although it promises a mechanism in principle, it simply does not work for the time scales of hours to weeks and even longer that are observed for precognition. Moreover, if information transmission by such a mechanism would indeed occur, physical apparatus should be realizable to demonstrate the effect in a physics experiment and in existing experiments such effects should have been observed.

In the literature, many aspects of physics, from electromagnetic radiation to neutrinos and tachyons, have been proposed as responsible for the mediation of paranormal phenomena. Here, only a few specific aspects will be mentioned, whereas for the broader overview the review by Stokes (1987) is an excellent reference. In order to place observational theory in its proper framework within physics, I will first briefly outline the quantum mechanical measurement problem.

The Measurement Problem

In quantum mechanics, a physical system is described by its wave function. However, the wave function cannot be observed directly, but, in the conventional view, is identified with the statistical distribution of observed events.

To give a concrete example of conventional quantum mechanics, suppose we have a Stern-Gerlach device, which produces electrons that upon observation have their spin either up or down. The spin of each electron is easily detected, since electrons with different spin are deflected differently in the apparatus. The quantum mechanical description of one electron before observation is a wave function that does not assign a definite up or down spin direction but only states that the probabilities of spin up and spin down after observation are both 50%. The wave function is, according to the usual interpretation, the most complete description of the system, so we cannot ascribe a definite spin direction up or down to the electron before the observation. Upon observation, however, each electron obtains either spin up or spin down.

Conventional quantum mechanics considers the statistical distribution of the electrons and identifies this with the probability distribution predicted by the wave function. The postulate of statistical determinism ensures this (d'Espagnat, 1976). However, the step from the wave function to the observed individual electron has not been taken without some reservations. This is the subject of the "measurement problem", a central issue in the interpretation of quantum mechanics (Bell, 1987; d'Espagnat, 1976). The measurement problem has been debated between prominent theorists who were keen on understanding how measurement results come about, instead of being satisfied with the mathematical formalism and the ensuing statistical predictions. Some of these theorists (Wigner, von Neumann) have at some time suggested that only upon arriving in the consciousness of the observer, the probabilistic event becomes concrete, such as a spin becoming either up or down. Other quantum physicists have discarded such a view involving consciousness as pure mysticism. From the viewpoint of physics, consciousness is an ill-defined and ill-fitting concept and it is only rational to regard it as a bad apple in the basket and keep it outside of the theory proper as long as possible.

A way to quantify the measurement problem is to compare the information content of the electron wave function before the electron has been observed, in the 50% up, 50% down state, with the situation after observation, when the electron is with certainty in one state and not in the other. The usual Shannon information is larger in the second case. As long as the information which has been apparently added to the electron is random, the statistical distribution will remain as predicted. If, however, the added information is biased, we may observe a biased statistical distribution of the electron spin.

The last half-century has seen numerous attempts to resolve the measurement problem of quantum mechanics (QM), but no consensus has emerged. Some recent proposals are known as 'decoherence' theories. Quantum decoherence is the phenomenon that through interactions with the environment the information required to produce the characteristic quantum interference effects is almost immediately lost in the many degrees of freedom of the environment. Decoherence theories assert that this produces a definite state in the measuring instrument immediately after interaction with a quantum system, although the formalism does not tell us which state has thus become definite. Jeffrey Bub calls this an "ignorance interpretation". While he discusses different versions of this approach, he argues that the measurement problem is not resolved by "this manoeuvre" (Bub, 1997). With regard to the relative popularity of problems and solutions, Bub remarks at the beginning of the section on decoherence: "For most physicists, the measurement problem of QM would hardly rate as a 'small cloud' on the horizon. The standard view is that Bohr had it more or less right, and that anyone willing to waste a little time on the subject could easily straighten out the muddle philosophers might get themselves into" (Bub, 1997, p. 212). All irony apart, Bub alludes here to a lecture by Lord Kelvin on the status of physics at the end of the 19th century (Kelvin, 1901). The two 'small clouds' of that time led to the relativity theory and to quantum mechanics.

Thus far a synopsis has been given of the measurement problem, as it can be discussed within physics. The problem of the transition from the indefinite to the definite seems unsolvable in present-day physics. But new resources become available when we consider the problem in a wider context. Thus, the role of the measurement problem alters fundamentally if new experimental data are brought to bear upon it. This is what parapsychological research findings will effect if they are considered within the conceptual framework of observational theory.

Before we evaluate observational theory in this respect, we will consider another aspect of the relationship between physics and parapsychology, namely the concept of non-locality, which has been the cause of some misunderstandings about observational theory.

Non-Locality

In discussing theories of paranomal phenomena, parapsychologists often refer to the 'non-locality' of quantum phenomena. The phenomenon of the non-locality or non-separability of wave functions is best known from the Einstein-Podolsky-Rosen paradox, a gedanken experiment that was originally proposed to show the absurdity of quantum mechanics in 1935. Until 1964 this remained a moot point, as it seemed to have no consequences for experimental outcomes. In 1964, John Bell showed that the essential spatial extendedness, or 'entanglement', of wave functions could have experimental consequences and this was confirmed by Alain Aspect and his coworkers in 1982 for the first time and in many experiments since.

An interesting corollary is that an issue which at first has to do with the understanding of the theory and how to paint a satisfactory mental picture of it became an experimental issue, with the possibility of quantum mechanics to be rejected by experimental outcomes, as new experiments were invented. As it is, quantum mechanics was vindicated and the reality of entangled quantum states which have a non-local character confirmed.

Some attempts to explain psi have focussed on this non-locality of the wave function. However, despite the fact that "non-local correlations" do indeed exist, it is hard to imagine a wave function describing, in a precognition experiment, the compound system of the human subject on the one hand and a random number generator of which the outcomes are to be predicted on the other hand. Furthermore, according to the formalism of quantum mechanics, no transfer of information is possible via non-local, or EPR-, correlations. Carrying the "non-local explanation" of psi to the extreme, sometimes the argument that all elementary particles in the universe have been connected with each other at the big bang is seriously put forward. Indeed, that may be the case, but if an apparent information transmission is possible between one collection of particles and another, why doesn't this effect show up in physics experiments? And, moreover, why would this specific prediction come true and why doesn't it connect to any other process in the universe?

Lack of specificity is a bad property of a theory. A theory of psi based upon non-local correlations might be called a permissive theory: Everything is possible, but this implies that nothing specific can be predicted.

But, one might ask, what about the relationship between the observer and the observed system; can't we regard this as a non-local correlation? Here, the "colloquial" approach we follow reaches its limits. However, the necessary technical treatment shows that the relationship between observer and observed system is fundamentally different from a non-local correlation. Exacerbating the conceptual muddle, non-local correlations have become associated with 'holism', a panacea which again sadly fails on the specificity argument.

At this point we may surmise that, from the point of view of present-day physics, the only possible (that is, imaginable within present-day physics) mechanism for psi lies in the measurement problem and in hypothesizing a role for the conscious observer in the collapse of the wave function. This will be argued for in the remainder of this paper.

Parapsychologists and Physicists

Scientific parapsychology has traditionally been practised mostly by psychologists and scientists from various other disciplines, some with a definite preference for a mind-brain dualism. For them, quantum mechanics is the bad apple (or an esoteric gem) in the psychological basket. The other side of the same coin is that for quantum theorists "consciousness" is the bad apple in the physical basket. The use of the word "quantum" in a more or less mystical sense is not any less frequent than the misuse of the term "paranormal" for any unusual, arousal-provoking story. (There has been no reason for quantum physicists to abandon the word "quantum" anymore than there should be a reason for parapsychologists to abandon the words "paranormal" and "parapsychology".)

These problems, that physicists and parapsychologists have with each other's technical terms, are paralleled by the two main problems of parapsychology, namely of the mediation and the manifestation of psi.

Observational Theory

The History of Observational Theory

The basic idea of observational theory was first formulated by Evan Harris Walker (1973, 1975), who tried to identify quantum processes in the brain with the quantum uncertainty in observed random events. In his view, the essential connection between the human observer and the observed random process can be represented by 'hidden variables' they have in common. Hidden variables theories were fashionable at that time as candidate solutions of the measurement problem of quantum mechanics.

Furthermore, Helmut Schmidt (1975) proposed a simple mathematical model of psi, based on the premise that the probabilities of random events become biased through being observed by the subject in an experiment. Although the theories by Walker and Schmidt primarily explain the influence of an observer on a quantum mechanical random process, it was Schmidt who showed that the same mechanism can explain precognition and ESP in general. Implicitly, Schmidt supposed "Von Neumann's hierarchy" (d'Espagnat, 1976) to apply to unobserved—quantum mechanical—random events. Therefore, in these theories the role of the observer in quantum mechanics is the central concept.

Not surprisingly, the generic name 'observational theories' was coined shortly afterward (Houtkooper, 1977), followed by a review by Millar (1978). This author scrutinized observational theory with regard to the interpretation of quantum mechanics, both from the experimentalist's viewpoint and from the viewpoint of the philosophy of science (Houtkooper, 1983). To my initial surprise, the most fruitful view was provided by the orthodox Copenhagen interpretation of quantum mechanics, or, in Bub's terminology, the "orthodox Dirac-von Neumann interpretation". The conclusion was that the phenomena which are usually regarded as representing 'backward causation', such as precognition and retroactive PK, can be understood by assuming that random events which have not yet been observed remain in a state of 'indefinite reality'. They only obtain a definite status upon observation. In this view, which is compatible with quantum mechanics, ordinary causal relationships between events can be maintained. The cost of maintaining causality consists of having to give up realism with regard to quantum mechanical random events.

In the 1980's observational theory has been discussed in various articles, of which those by Schmidt (1984) and Walker (1984) may be mentioned, although not reviewed here. Applications in experiments have been scarce and the elaborate protocols have apparently not been conducive to the occurrence of psi in these experiments (Houtkooper et al., 1989; Johnson & Houtkooper, 1988; Schmidt & Dalton, 1999).

The Unification of Paranormal Phenomena

The idea that PK and ESP belong to the same class of phenomena goes back, at least, to the mediumistic scéances of the 19th century. Observational theory for the first time provides a relationship and even a common mechanism for both phenomena. Schmidt (1975) has made this very explicit by 'constructing' a paragnost, which exhibits precognition, using a scheme involving a source of PK. PK is to be regarded as the basic phenomenon, acting on quantum mechanically random events. Assuming Von Neumann's hierarchy means that unobserved random events remain in a state of 'indefinite reality'. Upon observation the particular outcome of a random event is determined. This explains the apparent success of experiments with retroactive PK.

In a precognition experiment, the target is a picture or symbol, determined randomly some time before the experiment proper. The experiment consists of a subject guessing, using his or her intuition or imagery, what the target might be. After this, the correspondence between target and guess is determined. The outcome of the experiment is therefore determined at the moment this correspondence is observed and the preference of the observer of the correspondence between target and guess must be a major factor in determining the success of the experiment. In other words, precognition is simply retroactive PK in disguise. The same explanation holds for the other ESP phenomena, telepathy and clairvoyance. Therefore, the paranormal phenomena have a unified explanation within observational theory.

The ramifications of Schmidt's unification theorem, such as the a priori pairwise stochastic independence of target, guess and correspondence, and the application to psi in real-life situations, may serve to further develop observational theory.

Observational Theory and Lakatos' Methodology of Research Programmes

When considering pros and cons of observational theory, we may regard observational theory as a research programme in the sense of Lakatos (1978). Lakatos' view of the acceptance and rejection of scientific theories is different from Popper's: If theories have apparently been falsified, they protect themselves against falsification by secondary theories or "auxiliary hypotheses". The basic theory which is thus defended is the "core theory" and it has some resemblance to Kuhn's "paradigm" (Kuhn, 1962). To cite an example of Lakatos: The anomalous precession of the perihelion of the planet Mercury was well known in the 19th century; instead of regarding this as a falsification of Newton's law of gravitation, astronomers hypothesized a new planet between the sun and Mercury as the cause and searched for it, but in vain. The cause of not finding it was blamed on the difficulty of observing a small object close to the sun. It was Einstein's general relativity theory which explained the observations without the need for an extra planet.

Therefore, according to Lakatos, theories are accepted or superseded, not by the outcome of a crucial experiment or observation, but by their connections with other theories and their explanative power on the one hand and their need for protection to explain away the falsifications and to defend themselves against conflicting experiments on the other hand. These characteristics are called, respectively, the positive and negative heuristics of a theory. The theory, as it develops its different heuristics, is called a research programme.

Observational theory can be best characterized by its central axiom: **"The act of observation by a motivated observer of an event with a quantum mechanically uncertain outcome influences that outcome."**

This is the core theory in the sense of Lakatos. By a “motivated observer” is meant an observer with a conscious or unconscious preference for one specific outcome over the other possible outcome(s).

Thus, we may regard observational theory as a research programme in the sense of Lakatos. Next, we examine the positive and negative heuristics of observational theory, in order to show to what extent observational theory can be considered a fruitful approach and to what extent it has some unwanted characteristics.

Positive Heuristics of Observational Theory

1. The phenomenon of retroactive PK was predicted by observational theory: The moment of observation is crucial instead of the moment of generation of the random events. In experiments with retroactive PK, or ‘retro-PK’, random events are generated and recorded some time before the proper experiment is conducted. In the experiment, the random events are presented to the subject, possibly without he or she being aware of the fact that the events are not being momentarily generated. As it is assumed, based on “Von Neumann’s hierarchy” (d’Espagnat, 1976), that the randomness of the recorded events is not compromised by having been stored, this delay of the observation should make no difference for the PK effect. In fact, this idea has been corroborated by experiments with prerecorded trials. Moreover, in these experiments with retroactive PK some good experimental corroboration has been found for the influence being exerted at the time of feedback to the subject, and not at the time of generation of the prerecorded trials (Schmidt, 1976). This means observational theory has proven its power to predict new phenomena and that the central axiom has found direct support.
2. Precognition is accounted for without needing an (ad hoc) extra mechanism. Schmidt (1975) showed the equivalence of precognition and PK if one assumes an observational model. As clairvoyance and telepathy are equivalent to precognition in real time, the various paranormal phenomena, psychokinesis, telepathy, clairvoyance and precognition, can be unified into one basic mechanism. In other words, observational theory is parsimonious in comparison to theories which invoke different principles for different paranormal phenomena.
3. Observational theory predicts specifically the possibility to manipulate effects, such as in repeated retroactive PK, so that detailed models can be formulated and tested. Such a model, the hierarchical model (Houtkooper, 1983), was devised on the basis of indications from experiments. It implies a diminishing influence of the observations by later observers of the same random events, through a “psi-absorption” parameter assigned to observers. The designs based upon this model promise experimental results with a better reproducibility than had been hitherto achieved.

4. The use in PK experiments of random processes, like dice and RNGs, instead of sensitive instruments to measure small static forces, can now be justified on the grounds of the consideration of psi effects as effects acting upon the quantum mechanical uncertainty in these random processes. Experimental corroboration is found in PK experiments with a gifted subject who could reproducibly influence the motion of cubes rolling on a horizontal surface, but not the motion of a ball rolling down an incline (Forwald, 1977; Pratt & Forwald, 1958).
5. The experimental finding that psi effects are independent of the complexity of the random process involved (Schmidt & Pantas, 1972), can be explained by the act of observation as the crucial event at which a psi effect is mediated. Devices used as PK target systems, like numerous dice in one throw, noise-based RNGs and even the speed of radioactive decay of uranium, are highly non-transparent to the PK agent. The success of these devices in ensnaring ostensible psi-effects has hitherto been a source of concern for theorists. Observational theory predicts on the one hand the success of devices which feature complex and even microscopic randomness and on the other hand the scarcity of controlled experiments in which macroscopic forces have been measured and revealed psi-effects.
6. Observational theory bears directly upon quantum mechanics, in that the existence of psi effects contradicts the principle of statistical determinism (d'Espagnat, 1976). The important limiting principle is that the deviations from this principle all involve the observation of quantum mechanically uncertain variables by a motivated observer. Thus, observational theory has a direct conceptual relationship to quantum mechanics.
7. The unsolved problems in observational theory appear to have their analogues in quantum mechanics, namely the problem of what constitutes an observation (in quantum mechanics: a measurement) and the problem of how to determine the order in time of observations (in quantum mechanics: the order in time of spatially separated measurements). That is, the direct relationship to quantum mechanics may yet prove to be fruitful for quantum mechanics as well as for observational theory.
8. Implicitly, parapsychological researchers still use a transmission paradigm in their design of experiments. The major drawback of this view, or rather, prejudice, is that conditions of observation of random events are not noted. An example is the very successful series of ganzfeld experiments reported by Honorton (Bem & Honorton, 1994; Honorton et al., 1990), where it is unclear who, either sender or experimenter, is the first to observe the target-guess correspondence. Ganzfeld experiments are experiments on the ostensible transference of information between a 'sender' and a 'receiver', in which the receiver is put in a situation of mild sensory deprivation. The receiver speaks out his or her impres-

sions, the 'mentation'. Usually in these experiments, the sender may hear this mentation. Even if this is the case, and the sender listens to the receivers' mentation, it is unclear whether the sender is the first to know if the session was a success. Accepting the possibility of observational theory means that the importance of the observation of outcomes of an experiment has to be stressed, as a formal part of the experiment. Also, if the transmission paradigm is regarded as an alternative to observational theory, observational theory forces it to reveal itself openly, including its auxiliary assumptions, such as the issue of real time transmission—Parker and Persson (1999) are taking up this challenge—and the properties of sender and receiver.

9. Not only PK, but also ESP experiments, can and should be designed using observational theory. Both a blind-matching and a ganzfeld experiment have been designed and carried out by the author in collaboration with others: First, the ganzfeld experiment reported by Houtkooper et al. (1989) aimed, among other things, at showing the role of feedback in ganzfeld experiments. An observational part was added to the design of an otherwise ordinary ganzfeld experiment. Results of the experiment revealed no psi, so that corroboration for neither observational nor transmission paradigm was obtained. The second was the blind-matching experiment reported by Johnson and Houtkooper (1988). Likewise, it was unsuccessful in revealing straightforward psi-effects, so that the effect of later observations could not be ascertained. Lack of experience and familiarity with the somewhat cumbersome observation procedures may in part have been the cause of these disappointing results, but nevertheless these experiments may show that observational theory can very well be applied to experimental designs.
10. The apparent effects of experimenter psi can be understood as effects of the experimenter as a later observer (Weiner, 1982; Weiner & Zingrone, 1986, 1989) of the data of his or her experiment. Apart from normal, psychological experimenter effects, apparent effects of the experimenter have been observed in situations where normal sensory channels do not apply. These are ostensible cases of parapsychological experimenter effects, or 'experimenter psi' (Houtkooper, 1994; Irwin, 1994; Schmeidler, 1977).

Negative Heuristics of Observational Theory

We should be well aware of the negative heuristics of a research programme, because these would eventually be the cause of its possible obsolescence and demise:

1. The Central Axiom is, by itself, non-falsifiable: In principle, all experimental outcomes that can be discussed have at one time been observed. Also, motivation can hardly be reliably measured, apart from its end-ef-

fects. This means we may have to get hold of specific properties of specific observers and study their individually different effects. Moreover, the influence of later observers of the same data (which may be in the form of the overall outcome of the experiment) has to be constrained in some way, because otherwise no experiment is ever finished. This requires viable and fruitful models of the influence of later observers, such as the hierarchical model by Houtkooper (1983), which is one possible solution to the problem of later observers.

2. The number of parameters even the simplest model requires makes it hard to falsify in a practical experiment. To keep the observer's motivation and disposition constant is a requirement that is hard to satisfy. These problems, albeit technical, need to be overcome if progress is to be made. Research with outstanding subjects is one way of solving this and another would be to find conditions which lead to reproducible results.
3. Even in the case of the hierarchical model, which can be considered to be one of the simplest models, parameters can easily be adapted to account for nearly any experimental outcome as long as the effects are as weak as they usually are. Moreover, auxiliary hypotheses can be put forward, for instance concerning the observation of outcomes by experimenters, to protect the model against falsification. The further sophistication of experimental designs is the obvious way to overcome these difficulties.

Conclusions

Observational theory is a viable research programme for paranormal phenomena. Its main properties are a) **predictive power** (with regard to retroactive PK), b) **parsimony** (the paranormal phenomena, ESP and PK, can be explained by one and the same mechanism), c) **fruitfulness** (a direct relationship to quantum mechanics), and d) **openness to crucial experiments** distinguishing—as far as that is possible within Lakatos' philosophy of science—between the predictions of, on the one hand, observational theory and, on the other hand, alternative theories and models.

Thus, as shown by the positive heuristics, the questions to be answered by parapsychological experiments become more interesting. In Lakatos' terminology, observational theory must be regarded as a positive problem shift.

The negative heuristics of observational theory stem mainly from the requirement of falsifiability. This criterion should be applied to specific theories and models, but not to research programmes or core theories. This points to the necessity to develop specific theories, such as the hierarchical model. Furthermore there is the very practical problem of small effects and rather imperfect reproducibility. Although observational theory is no cure for all problems, it offers an explanation for the mediation of psi. This provides experimental research involving the manifestation of psi with a more fruitful basis.

Research programmes are superseded by superior ones. The alternatives to observational theory are unspecified and ad hoc transmission 'principles' for

ESP and likewise field models for PK, or, more recently discussed is Decision Augmentation Theory (DAT): May, Utts, and Spottiswoode (1995) proposed a mechanism for the mediation of psi in that the subject basically uses his or her intuition to decide between targets in an ESP task, whereas PK is explained by waiting to start a run until the random event turns out favorably with regard to the target—whereby PK is explained as ESP. May et al. find support in existing data on the dependency of effect size on run length (May, Spottiswoode et al., 1995), which has been criticized by Dobyns and Nelson (1998). Is DAT a superior research programme?

An experiment which would discriminate between DAT and observational theory is quite obvious: One has to separate the subject who pushes the start-button from the subject who observes the outcome. Experiments with retroactive PK are a case in point: Schmidt's (1976) experiments are hard to explain as an effect of DAT, except as a contorted case of an experimenter effect. Furthermore, DAT has some elements in common with observational theory, such as 'state selection', but in contrast, DAT lacks a physical basis for 'intuition', whereas observational theory indicates the point in conventional physics where psi can be fitted in. This point in physics is the observation of a quantum mechanically random event by an intent observer. The conclusion must be that DAT is conceptually less fruitful and finds as yet less experimental support than observational theory.

As observational theory indicates the point in physics where "the action is", it is clear the same indication specifies where the psychology cum neurophysiology of paranormal phenomena should aim, namely at the same intent observer, in parapsychological experiments, as he or she observes a quantum mechanically random event which is the the subject of his or her intention.

Parapsychology will not make progress if it doesn't come to grips with specific models of the underlying phenomena. Certainly, the difficult area of relationships with psychological variables will have a hard time if it doesn't take into account the best available assumptions about the basic mechanism of psi. Observational theory provides such a basic mechanism and this should bear its fruits if applied in the design of future experiments.

How likely is it that experimental parapsychologists take heed of observational theory in the future? A note of caution is in order: The very idea of a theory that specifically includes the experimenter himself will have profound difficulties in establishing itself. This is an element that is new to science and one that implies requirements of experimental methodology that still have to be explored. In fact, the only example—that I know of—of an intimate interaction between the researcher and object of research is in primatology (De Waal, 2001). In parapsychology, the situation is more extreme: Every wish or motivation of the experimenter may well influence the result of an experiment decisively. The methodological difficulties this entails are by no means close to a solution.

Nevertheless, parapsychology fits well in the picture painted by Dijksterhuis (1950) of the evolution of science: The ancients started their scientific endeavours with astronomy. Physics developed at a much later stage. Biology became a science after that and only in the second half of the 19th century was psychology developed. The obvious ‘inward’ movement, namely from the cosmos to the mental phenomena of human being, inexorably seems to lead to a science where the researcher is part and parcel of his or her object of research. To accept this role will be a psychological stumbling block, but, despite our very wish and need to have an objective science, it is the challenge apparently posed by paranormal phenomena.

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