

# CONSCIOUSNESS INDUCED RESTORATION OF TIME SYMMETRY (CIRTS): A PSYCHOPHYSICAL THEORETICAL PERSPECTIVE

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**ABSTRACT:** A theoretical framework is proposed that starts from the assumption that information processing by a brain, while it is sustaining consciousness, is restoring the break in time symmetry in physics. No specifics are given with regard to which physical formalism, either quantum or classical, is the basis of the subsequent apparently anomalous consequences: “apparent” because the proposed model doesn’t require a radical extension or modification of existing physics. Rather it is argued that time symmetry that is already present in current physics should be taken seriously, and a simple initial mathematical formulation is given that allows for specific quantitative predictions. The elusiveness of psi phenomena, the experimenter effect, and the relationship of psi to other theoretical frameworks like decision augmentation theory (DAT), observational theory, and several others, are discussed. One of the major advantages of CIRTS is that it offers handles to link this theory to psychological theories that might explain individual differences. Specific testable predictions are given.

According to Popper (1934), substantial progress in science is obtained if theories are rejected. This argument is often used to justify the study of anomalous phenomena. However, in practice, most research in most sciences follows a different path where probabilistic induction, often seeking support for a theory, is used. Although Popper has been harshly criticized, there is no doubt that seeking support of a theory does result in slower progress than refuting a theory, but this is only true if one can come up with a better theory accommodating the new data.

The progress of parapsychology has been frustrated by the fact that after rejection of the mainstream theory that all “so-called paranormal” phenomena could be explained by errors, there were no generally accepted theories from which precise *falsifiable* psychological hypotheses could be derived. DAT predicted a relationship of effect size with number of observations, dependent on how many human decisions were involved in getting the end result. This prediction differed for RNG-PK from force-like models but did not in principle conflict with other information-based models like Observational Theories (OTs) that attributed the results to instances of (meaningful) observation. The ensuing discussion about what the data actually showed illustrates that these models lack specificity with regard to the underlying processes (Dobyns, 1993). The majority of paranormal researchers, often psychologists, are oblivious to the specialized quarrels of a few physicists and continue to find *supporting* evidence for a kind of “magical” world view where things happen that cannot happen, even when these researchers are doing process-oriented work. The processes that are investigated are generally based upon some intuitive notion or a haphazard finding in previous work and not on a theory.

Since psi phenomena are labeled anomalous because they *appear* to be in conflict with our present day physical worldview, any fundamental psi theory should be an extension or a modification of physics. Psychology is not in conflict with psi phenomena per se, so although psychological theories like Honorton’s noise reduction model are useful when speculating how to optimize effect size, they do not touch upon the apparent anomalous character of psi.

Extension and modification of physical theories have been proposed by Walker (Walker, 1975); Millar and Hartwell (1979); Houtkooper (1983); Kornwachs and Lucadou (1985); Josephson and Pallikari (1991); May, Utts, and Spottiswoode (1995); and most notably for the present proposal, Donald and Martin’s (1976) framework based upon time-symmetric thermodynamics. Although originally developed to explain the genesis of forms in biology, “morphogenetic field theory” can also be considered to assimilate (some) paranormal phenomena (Sheldrake, 1988).

The observational theories (Walker, 1975) assume that the act of observation “injects” information into the observed system, independent of time and space. This approach showed that it was possible to unify all psi phenomena in one theoretical framework. The correlations found in telepathy, clairvoyance, precognition, and PK experiments all were supposed to be produced via the observation of the correlation, that is, upon feedback. The OTs were based upon an especially unpopular solution of the measurement problem in physics, a position that gave special status to an observer. Thus these theories are intrinsically dualistic.

In the present proposal, the focus is upon “time” rather than “information” although the two are related through the second law of thermodynamics. Like the OTs, the present theory claims to unify all psi phenomena.

Based upon converging evidence from many different experimental paradigms, most notably presentiment, I propose to take seriously the fact that most physical formalisms— for instance, electromagnetic theories—are inherently time-symmetric. Although in physical systems time symmetry is not observed, I propose that conscious observation does remove part of the constraints that prohibit time symmetry to occur.

This framework results in straightforward hypotheses that can easily be tested.

#### THE DATA: EXPERIMENTAL TIME ANOMALIES

##### *Precognition*

Many case reports in the old psi literature concern precognitive dreams (Gurney, Myers, & Podmore, 1886). Dunne (1927) wrote a book, *An Experiment with Time*, in which he not only described many experiences but also gave a theoretical framework. One of the most interesting cases in that book has hardly been noticed in the modern parapsychological literature. It concerns a dream in which a specific number of victims of a disaster appeared. This number was later confirmed in a report in a daily newspaper. Many years later, Dunne, while doing further research on the case, found out that the number mentioned in the newspaper was incorrect. The actual number of casualties was much larger. The conclusion Dunne drew was that the precognitive dream was not on the disaster itself but on the feedback he got from the newspaper! More recently, in a remote viewing trial, the psychic Pat Price described a target location as it was on the old picture that was given as feedback although the actual target had changed after this picture had been taken (Targ, personal communication).

Among the parapsychological meta-analyses databases there is a less well-known but very significant meta-analysis concerning precognitive card guessing (Honorton & Ferrari, 1989). Precognition seems to violate one of the basic assumptions of western science, namely “causality.” The temporal order of cause and effect appears to be reversed.

##### *Retroactive PK*

Immediately after the first publication of the original observational theory (Walker, 1975), it was realized that this theory unified all psi phenomena by introducing the idea of retroactive psychokinesis. ESP phenomena, including precognition, were then accommodated by assuming retroactive PK at the moment of feedback on the brain state back in time when it was producing a call. Psychokinetic effects were all retroactive PK effects directly on a system having some quantum randomness as a determinant of its behavior. The concept of retroactive psychokinesis was ill chosen and caused a lot of confusion because the label suggested that the past could be changed. Rather, there was a “spooky correlation at a distance (in time)” whereby future and past conditions seemed to participate in a handshake that would determine the present.

Such a process should have been described as the present being contingent on future conditions, these conditions mostly being future mental states. This phenomenon had been predicted by the observational theory before it ever was observed. This was the first sign that theory building in parapsychology had reached a mature state. Indeed, retroactive PK experiments were done and in a review of all this work, it was concluded that the effects were as strong if not stronger than in real-time PK experiments (Bierman, 2004).

##### *Presentiment and Ganzfeld*

John Hartwell (1978) published the results of an experiment in which he measured EEG activity in a cued selection task where the random stimuli consisted of a happy or sad face. He found (nonsignificant) differences in the contingent negative variation [AU: Correct?] (CNV) preceding feedback. Since the result was nonsignificant it took another 15 years before Dean Radin (1997) attempted a conceptual replication using skin conductance rather than EEG. The power in this replication was much larger and the results showed a clear and significant difference in psychophysiological behavior dependent on the future randomly chosen stimulus. The effect was labeled as “presentiment.” Since then, many conceptual replications have been undertaken. Dependent variables that have been used are evoked potentials (EEG), continuous negative variation (EEG), BOLD (fMRI), inter-beat interval (ECG), eye movements, eye blinks, pupil dilation and blood pressure. Stimuli that have been used are emotional and neutral pictures from the International Affective Picture System, loud and pleasant sounds, and a winning or losing simulated slot machine.

In all these cases significant results were obtained. There hasn't been a formal meta-analysis done yet but a good estimate is that significant results are obtained in 50% of the experiments.

Incidental observations of the noisy skin conductance at the trial level showed a remarkable form symmetry before and after the stimulus. For instance, if the response showed a double bump there appeared to be also a double bump, though smaller in amplitude, before the stimulus. Double response bumps may occur, for instance, when a picture shows a lot of redness but it takes some time to find out what really causes all that color (perhaps blood). Of course these anecdotal observations are just what they are, anecdotal, and therefore only have value for hypothesis or model generation (see Predictions section)

### *Other Time Reversal Paradigms*

Presentiment can be seen as a simple time reversed stimulus-response paradigm. Actually one of the big advantages of this approach is that the experiments are identical to normal experiments in the field of emotion research with psychophysiological variables. This time reversal idea has been extended to other standard paradigms in experimental psychology. Thus, we have retropriming (de Boer & Bierman, 2005) where the prime is exposed after the response is recorded, but nonetheless this affects the response to the target. Time reversed habituation where habituation by repetitive exposure of a picture seems to affect the judgment of the same picture at an earlier time (Bem, in press) has also been reported. In one of the most successful ganzfeld studies (Wezelman, Goerding, & Vanhoeven, 1997) an explicit retrostrategy was used. In this study there were no "senders." Rather, after the ganzfeld session was over, the receivers focused on the actual target trying to transfer the contents to their brain backward in time. Of course, judging was later performed by independent judges. Actually, normal ganzfeld experiments can also be interpreted in this way. In an early ganzfeld experiment, the hypothesis was that due to retroPK the original protocol produced by the "receiver" would contain elements of *all* targets in the target set that was observed later by that receiver. Indeed, it was found that independent judging of the whole target set against the protocol (compared with a randomly chosen control target set) provided suggestive evidence for psi on the whole set (Bierman, 1988).

### *Time Symmetry in Mainstream Data*

As has been noted, the presentiment paradigm is identical to most mainstream stimulus-response experiments with psychophysiological variables, for instance, in emotion research. Thus it should be easy to locate similar effects in mainstream data. However, randomization in the mainstream is mostly "randomization without replacement" in order to keep some counterbalancing and have all cells in a design equally populated. This prevents strong conclusions when analyzing the data because "randomization with replacement" is required for that. Subjects generally pick up quickly on the distribution of trials over the conditions and start to guess what the condition of the forthcoming trial will be. One could say they fall into the trap of the gambler's fallacy, but alas, in the case of the generally used "randomization without replacement" this is no trap but gives the subject an above chance possibility of guessing the next stimulus condition. Nonetheless, two datasets of mainstream research could be analyzed, and in both, indicators of presentiment, cautiously called anomalous baselines, could be assessed, with the caveat that they could possibly be explained by weak randomization (Bechara, Damasio, H., Tranel, & Damasio, A., 1997; Bierman, 2000; Glöbisch, Hamm, Estevez, & Ehman, 1999). Recently, mainstream neuroscientists themselves point out that the brain behavior preceding stimuli or events seems to correlate with the type of event that will follow later. Although causal explanations are not totally excluded, these phenomena do puzzle these researchers, and one of them even "confessed" that time symmetry looked like a more natural explanation of his data (Lamme, 2008, personal communication). It concerns phenomena as diverse as: monkey brains indicating what the movement of an ambiguous stimulus will be (about 3 s before stimulus onset; Naotsugu, 2008), subjects performing a voluntary choice between two alternatives (about 10 s before decision; Soon, Brass, Heinze, and Haynes, 2008), [AU: write out term first] (TMS) induced percept doubling where the illusory percept seems to act as a prime (Joly & Lamme, 2010). Other TMS-induced apparent retrocausal effects are in a Libet paradigm (Lau, Rogers, & Passingham, 2008) and pupil dilation (Einhauser, Stout, Koch, & Carter, 2008).

## TIME SYMMETRY IN PHYSICS

Almost all formalisms in physics are time-symmetric. Given specific initial conditions, solving the equations generally results in two solutions which are identical but reflected in time:  $S(t) = S(-t)$ . This holds for classical particle mechanics, electromagnetic theory, and depending on the type of formulation/interpretation, also for quantum physics. In the transactional formulation of quantum physics this is most obvious. Formulations of quantum physics that interpret the projection postulate as a collapse of the wave function possibly introduce a break of time symmetry at the point of collapse. It should be noted at this point that several authors (Bierman, 1988; Costa de Beauregard, 1998) have already argued that, due to this fundamental time symmetry, paranormal phenomena are natural and *should* be expected as a part of physics.

Thermodynamics, or more generally, formalisms that deal with ensembles like statistical mechanics, seem to be the only exception although several authors have argued this is only due to boundary conditions (Price, 1996). In thermodynamics it is postulated that closed dynamic systems always develop with time in such a way that the structure in the system becomes smaller.

Thus a film of the trajectory of a (frictionless) billiard ball can be played forward and backward without anyone being able to discriminate between the two. This certainly doesn't hold for solving a sugar cube in hot tea. Actually *if* time would run backward in a thermodynamic system, one would observe this as an increment in structure. For instance, one could observe a sugar cube arising from a sweet solution by just stirring that solution.

*EM Theory, Wheeler and Feynman*

Although most physicists assume that the solution  $S(-t)$  of the physical formalisms is in some way forbidden, and in spite of the fact that this solution apparently has never been observed in physical systems, some theoretical physicists, most notably Wheeler and Feynman (1945), have tried to find a reason why this solution seems to be forbidden rather than impose the restriction ad hoc.

Wheeler and Feynman focused on classical electromagnetic theory because thermodynamic effects related to temperature are irrelevant there. So the question they tried to answer was "why do we observe a (retarded) wave going from an electromagnetic transmitter outward in space and forward in time, while we don't observe a collapsing (advanced) wave coming from afar to the transmitter (acting then as an absorber) going backward in time"?

After a thorough analysis they suggested that this asymmetry is due to the cosmos being far out of equilibrium. More specifically, they postulated that there was an extreme imbalance between the number of multiple particle coherent (quantum) transmitters, like lasers, and the equivalent multiple particle coherent absorbers (of EM radiation). Possibly a substrate known as Bose-Einstein condensate could be called a multiple particle coherent absorber. It should be noted that Price (1996) argues that the Wheeler-Feynman treatment of time symmetry was circular because by using the concepts of transmitter and absorber they subtly introduced some "preferred" time direction to begin with. Price also deconstructs suggestions in which the boundary condition of the Big Bang has been used to explain the fact that retarded solutions are totally dominant. The conclusion that this must be the reason for the breaking of time symmetry is still a controversial issue. However, the very reason that serious efforts have been made in theoretical physics to "explain" which conditions do result in this asymmetry suggest that there are also conditions under which the symmetry might partially be restored.

## CONSCIOUSNESS INDUCED RESTORATION OF TIME SYMMETRY (CIRTS)

*The Fundamental Speculation*

The fundamental assumption of CIRTS is that the brain, when it sustains consciousness, is a special system that partially restores time symmetry and therefore allows "advanced" waves to occur.

It should be stressed that this fundamental assumption does *not* violate any physics as we currently know it. The only thing it does is to speculate that solutions allowed by the formalisms but never observed might be observed under special conditions involving consciousness. Note further that it is not the brain per se that is supposed to be a time symmetry restoring condition, but only the brain that sustains consciousness. One of the big mysteries in consciousness research has always been that different brain regions process different aspects of an object, like color, form, and movement. Nonetheless, the conscious percept is an inseparable whole. Global and *coherent* synchrony in firing has been proposed as a means to bind these different aspects again into a whole. Therefore, we propose that coherence is a crucial moderating variable.

The basic assumption can further be specified by assuming that the restoration of time symmetry is proportional to some global coherence measure that also incorporates the brain volume involved in this coherence (Singer, 1999).

Thus, as shown in Figure 1, if we present a stimulus to a subject, then the “normal” solution of the physics that eventually results in a skin conductance measure might yield a signal  $S = f(t)$ .

[AU: we cannot print color, so you need to change the blue lines in the figures below to black or grayscale. Also note that figures can be a maximum of 4.5 inches wide to fit a JP page. Larger figures below have been resized. Please make sure the color is removed from the graphics themselves, not just on the screen. You do not have to re-send the entire file, just the corrected graphics.]

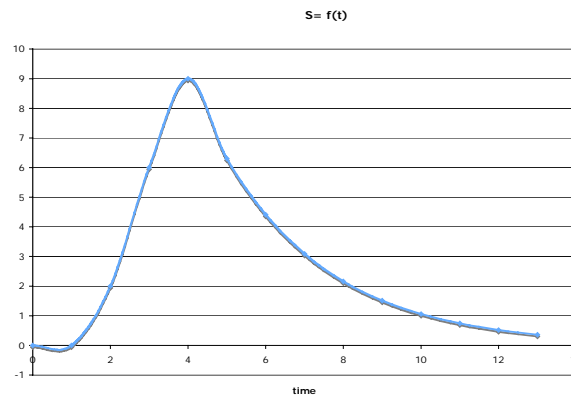


Figure 1. A typical skin conductance response. Time = 0 corresponds to stimulus onset.

However, if the stimulus is observed consciously, time symmetry will kick in and:

$$S = f(t) + A * f(-t) \tag{1}$$

$$A = \text{Relative coherence} * \text{Brain volume} / (\text{Total brain volume}) \tag{2}$$

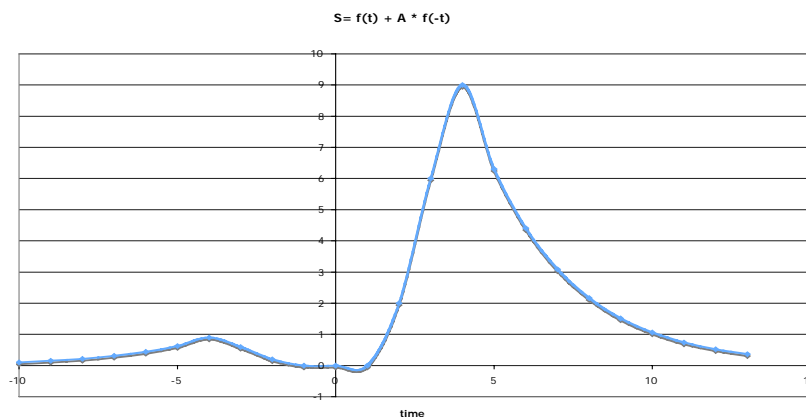


Figure 2. The theoretical skin conductance before stimulus onset is a weighted mirror image of the signal after stimulus onset. (A was set to 0.1)

This set of formulas reflects the fundamental assumption which results in a time-symmetric term in [1], basically the physical part. But [2] offers a link for psychological considerations. For simplicity, we assume that A is not very dynamic and does not change a lot over time. This is of course an oversimplification; most notably the effect of the stimulus might be a reduction in this coherence measure immediately upon the exposure of the stimulus to the subject. Coherence measures can be derived objectively from EEG measures while the brain volume involved can be assessed using fMRI.

Thus this simple approach allows us to calculate the expected signal over time using objective measures. Also it generates a simple principle: *What happens after, happens before.*

The fact that we use skin conductance as an example might seem confusing because that type of signal is delayed with respect to neural functioning. However, the model that we propose where time symmetry is restored, is not limited to neural signals. All underlying physical processes are assumed to be susceptible, even if these processes are not neural at all. The neural aspect is brought in as the *source* of the restoration of time symmetry, a coherent conscious experience.

In general, we argue that the dynamic characteristics of the “advanced” part will mimic those of the “retarded.” If we deal with a “slow” signal that peaks for instance 4 s after a conscious event, we might expect the retarded part to peak about 4 s before the conscious event. And if the “retarded” signal lasts a week, we might expect the “advanced” signal to start a week before the (consciously experienced) event, so it allows us to make precise predictions which will be discussed later.

### *Consciousness as the Crucial Variable*

In an unpublished pilot study on presentiment with short exposure times of pictures using skin conductance it was found that no presentiment effects occurred with 100 ms masked exposures when the subject was unable to report the contents of the picture. This suggests that conscious experience is a crucial condition for presentiment to occur.

### *The Time-Symmetry Point*

To arrive at more precise predictions we therefore add that the supposed time symmetry is not around the moment of exposure but around the moment of conscious experience. This is according to Libet’s famous experiments about 400 ms later (Libet, 1979). The symmetry formula becomes:  $S(t + 400) = S(-t + 400)$ . The part of the original signal that is not experienced consciously ( $0 < t < 400$ ) will not be reflected in time. The consequences for the example given above with the skin conductance are not dramatic. The presentiment peak shifts about 800 ms closer to exposure time. If the response peak is at 4000 ms then the presentiment peak is expected to be found around -3200 ms.

However for other faster psychophysiological signals using for instance  $t = 350$  ms as mirror point has dramatic effects. In Figure 3a, a typical evoked potential is given. In Figure 3b the theoretical sum of the normal and the time-symmetric component, as calculated from the formula [1], is given. **[AU: You need to separate these figures and move Figure 3b BELOW 3a in order to fit the 4.5-inch column width of the JP. When this is done, each figure can also be made slightly larger (but NOT more than 4.5 inches wide), which will make them more readable. Also, note that you will have to remove the color, as in earlier figures.]**

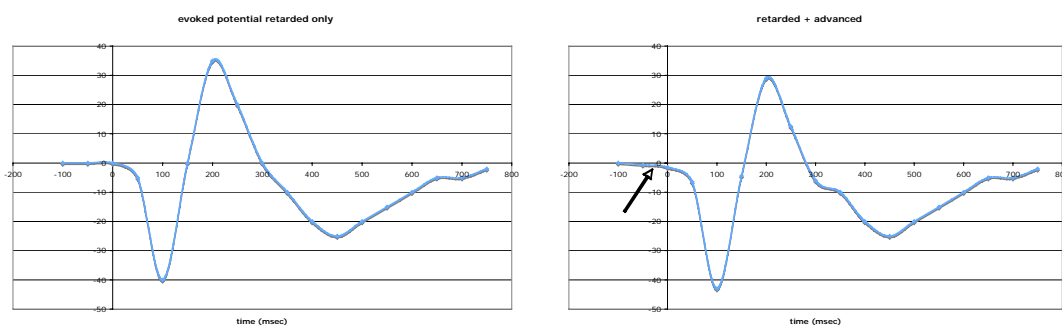


Figure 3. Example of evoked potential (a) and the same potential with the advanced component added (b).

The advanced part of that signal only contains a mirrored N350 component. Depending on the width of the N350 component and the difference between two stimulus conditions, we might expect a small effect just preceding stimulus onset. The half width of the N350 has to be larger than 400 ms. In this evoked potential simulation, we used an “A” value of 0.3 rather than the value of 0.1 we used for skin conductance above. Even so, the effect of the advanced solution *before* stimulus onset (arrow) is hardly observable. Adding the advanced component does also change the form of the evoked potential as well as the peak amplitudes, but that is after stimulus onset and therefore is not analyzed when looking for presentiment.

*Time Paradoxes: Does Time Symmetry Imply Retrocausation?*

Time symmetry actually does not imply that one can “change the past.” Rather, at any moment a signal has determinants that are from past as well as from future boundary conditions. Once the signal is there, one cannot use it to decide to change future boundary conditions. Conceptually this looks very much like the transactional interpretation of quantum physics where the present is determined by a kind of handshake between advanced and retarded waves (Cramer, 1986).

Time paradoxes are avoided and the negative time part of the solution cannot be used to transmit signals faster than light (negative time formally can be associated with faster-than-light speeds). Does this imply that the restoration of time symmetry is a useless phenomenon? Not quite. The advanced wave cannot be used to derive some behavior to prevent the retarded wave from occurring. So if we have a precognitive dream where candles are foreseen to set fire in the house the next day, it results in a paradox to remove all candles from the house in order to prevent the fire from happening. If the fire doesn’t happen, we will not have a “retarded wave” associated with this fire and hence no “advanced wave.” However, there might be a subtle way in which the restoration of time symmetry has helped us in evolution. If an emotional event, for instance the attack of a predator happens, the retarded part of the signal (in psychology called the *response*) will be strong, and hence also the advanced part. But that implies that the attacked animal is already aroused a few seconds before the attack, which might result in slightly superior survival changes. Of course this increased arousal only occurs if a real attack will actually occur in the (near) future because it hinges on the increased future arousal. Thus consciousness (induced restoration of time symmetry) offers an interesting evolutionary advantage.

*Psychokinesis*

The framework so far offers a neat unifying explanation of presentiment and precognition, and also all other GESP phenomena if they are conceptualized as precognition of eventual feedback.

Psychokinesis seems to fall outside the scope of the time symmetry framework but in fact fits in perfectly well. If in any thermodynamic system time is running backward, this will result in an increase of structure. Random systems start to show patterns. It has been speculated (Bierman, 1983) that the increase in structure might occur in the genetic code and thereby augment the evolution of species beyond the mere evolution on the basis of random permutations. Macro-PK can be explained by the chaotic behavior of air molecules around objects that generally result in an average or equilibrium “pressure” on the object that cancels out in all directions. However, if the air molecules become coherent and start to behave in a nonrandom and coherent structured way, movement of the object might be induced. We realize that this aspect of the theoretical framework is in need of more detail and a more precise quantitative treatment. But globally we can predict that again brain coherence measures should correlate with psychokinetic phenomena.

## THE ELUSIVENESS OF PSI

*Experimenter Effect*

In a typical parapsychological experiment, correlations are established, not signals going from somewhere to somewhere. That signals seem to be transferred is an interpretation—an interpretation that is extremely strongly felt because causality is deeply ingrained in our experience. However, each psi experiment is actually a complex random number generator which, if perfectly random, should give no correlations. Experimenters who run an experiment can be conceptually represented as running a PK-RNG experiment where they try to “influence” the random system in such a way that correlations occur. In this case the experimenters are actually the subjects in their own experiment. Individual differences might arise again out of the differences in brain coherences, either short-term, for instance in altered states, or long-term, for instance related to personality or the effects of many years of meditation.

*Declines*

Declines have plagued the field of parapsychology ever since its inception. Rhine’s original successful results evaporated more or less to chance levels after 60 years of experimentation (for a review of these declines: Bierman, 2001). It has been suggested that boredom of the experimenters

might be the causal factor for these declines. This would indeed explain the decline within experimenters but this boredom argument seems not suitable to explain across experimenter declines. In order to understand these latter it should be realized that time anomalies are opening possibilities for paradoxes. This is most obvious for time travel. If it would be allowed for someone to travel back in time and to kill one's own grandfather there is a paradox. But a similar argument applies for getting information from the future that can be acted upon so that the future event can be prevented from occurring. But if the future event is prevented it never could be the source of the future information. This ad hoc argument of nature preventing paradoxes has also been put forward by Hawking (1992) as chronology protection in his discussion of black holes and time reversal. The development of replicable experiments therefore poses a challenge because a replicable experiment opens possibilities for the creation of paradoxes. If this argument holds, replicable evidence for psi phenomena can only be obtained from experimental data that do not allow for such paradoxes to be created. Presentiment experiments are an example because the effects are nonconscious and so weak that they are only perceivable after averaging and thus cannot be used on an individual level. According to this type of reasoning, any attempt to increase the effect size such that one could act upon the presentiment signal would fail. Interestingly, such an attempt was undertaken by using 100 subjects simultaneously and then detecting presentiment "warnings" by averaging over these subjects per trial (Spottiswoode, 2006, personal communication). As predicted, this experiment yielded null results.

#### RELATION OF CIRTS TO OTHER THEORIES

##### *Physics-Inspired Theories*

*The observational theories (OTs).* As in the OTs, in CIRTS observation does play a crucial role. The "absorption of information" by the coherent brain is thought to be the boundary condition that restores time symmetry. In the OTs, physics is kept intact except that observation is supposed not to be a passive process but also an active process by which information streams into the observed system, thereby allowing structure to arise in otherwise random systems. In CIRTS the creation of structure or information is indirect through consciousness-induced time reversal and the second law in reverse. The most obvious difference is that in CIRTS the required brain state for the anomalies to arise is explicit while in the original formulation of Walker (1972) this was implicit and related to a not well-specified concept called the "will channel." Interestingly, lab lore has it that "willing" and "striving" are not optimal conditions for anomalies to arise; rather the optimal attitude seems to be a passive expecting.

There are two formulations of the OTs that are worth considering further. In Millar and Hartwell's (1979) formulation, the interpretation that quantum physics is fundamentally a theory dealing with potentialities is extended to the OTs—not with actual observations playing a role but rather with potential observations. Although this extension is elegant and seems to fit with modern interpretations of quantum theory (Stapp, 1996), there is an intrinsic problem to assessing these potentialities. Because they are dynamic, they change over time, so when do you determine their values? Millar and Hartwell's formulation would also predict that anomalies should relate to potentialities rather than actuality. Radin (1988) has done quite relevant precognition experiments comparing predicting the actual future with predicting the probable future. His experiments were inconclusive with one favoring the actual future as the target of prediction, the other the probable future. Targ (1998) asked the same question in the context of remote viewing experiments. This time the answer was an unequivocal "one can only foresee an actual future." This is of course what would be expected in CIRTS.

##### *Balancing*

The potentiality interpretation of quantum theory also makes explicit that in the end quantum theory can only be tested on the basis of distributions. Hence one could think that there is some freedom for individual events to become biased (as Walker proposes). In order to have nature's predicted distributions restored, it has been proposed (Pallikari, 1998) that an observed psi-induced bias in the long run should be compensated or balanced by another bias so that the quantum theory predicted distributions are not disturbed. However, quantum theory does predict distributions up to any order (variance, variance of variance, etc.) Any balancing mechanism would result in disturbing a higher order aspect of the distribution so that balancing seems not to be able to rescue standard physics. CIRTS, on the other hand, does not violate standard physics.

*Hierarchical OT model.* Houtkooper (1983) proposes a "hierarchical" specification of the OTs to avoid the apparent paradoxes that occur with unrestricted nonlocal time causing all future observers



to participate in an experiment. He introduced “order of observation” converging effects. In CIRTS there is no unrestricted nonlocal time. Rather the classical time and the reversed time do behave in a symmetric way. If there are no problems in the forward direction, there aren’t any in the backward direction.

If precognition is akin to remembering the future then we will expect the same time dependencies. For instance, the frequency of precognitive dreams will exponentially decrease with the time between dream and event just as memory exponentially decays. This was indeed the relation found in the analyses by Sondow (1988) of all her precognitive dreams over a period of many years.

The problem of who is (are) actually the one(s) that restore time symmetry, a problem that Houtkooper tried to solve in his hierarchical model, will be given for CIRTS in a separate paper.

*Decision augmentation theory (DAT)*. According to this theory, all psi phenomena can be explained by assuming that at some point in the experimental procedure a selected part of a random series is biased because someone presses a button at the right time to select just that part of the random series that will result in the appearance of the desired correlations (May, Utts, and Spottiswoode, 1995). Thus the basic mechanism is a kind of precognition on the part of the person, be it subject or experimenter, who hits a button that initiates directly or indirectly the random series acquisition.

The model seems a bit paradoxical because the authors want to explain away psychokinesis, especially micro PK, by assuming precognition. However, precognition presumably results in the biasing of a brain state (so that the button will be pressed at the magical moment) and if one assumes the brain is a physical system and its states have a random component then there is not much difference between biasing an RNG and biasing a brain state. Both should be labeled micro-PK.

Like the OTs, DAT is very explicitly an information-based, and not a force-based, model. As such, it fits with the psychokinesis integration of CIRTS. According to CIRTS there is a gain in information due to reversal of the second law when we allow time to run backward. This gain in information results in some structure in an otherwise random system. This gain in information might be expressed as correlations between two variables, although for all theoretical frameworks to date it is unclear why these correlations would correspond to some expected effect. Given the information-based character and the fundamental assumption of time reversal, it seems possible to accommodate some of the assumptions of DAT in CIRTS.

*Systems theory and weak quantum theory*. In Kornwachs and von Lucadou’s system theoretical model of paranormal phenomena, anomalous (nonlocal) correlations that arise are due to an isomorphism of system theory with quantum physics (Kornwachs & von Lucadou, 1985; Lucadou 1995). If one formally introduces meaningful information, as information that can be acted upon, then systems theory produces formulae that are identical to those found in quantum mechanics but, of course, deal with other observables. Kornwachs and Lucadou’s approach is a special case of the one that is undertaken in “weak quantum theory,” which is identical to quantum theory but with Planck’s constant being removed (Atmanspacher, Römer, & Walach, 2002), but these approaches do result in a similar position. The most notable consequence is that the correlations that arise cannot be used to transmit classical information. In CIRTS the situation with regard to signal transmission is subtle. The advanced wave of course carries information. This need not be quantum information, it could even be classical. Therefore it appears that signal transmission (back into the past) is allowed. However, the situation is such that the manipulation of the information source is restricted in order to avoid (binary logic) paradoxes, so it is forbidden to “use” the “advance wave” information to infer the future because that would allow avoiding the event that is “responsible” for that advanced wave. Thus the neo[Correct?]classical signal theorem in systems theory and indeed in each quantum-based theory is replaced by a slightly less restrictive rule in CIRTS.

*Time-symmetric thermodynamics*. As early as 1976, Donald and Martin (1976) suggested that causality violation was an inherent property of time-symmetric thermodynamics. Basically they formulated there the foundations of CIRTS, especially with regard to psychokinesis. They did not, however, link this to the peculiar coherent aspect of our brain producing consciousness, nor did they work out predictions that could be challenged by experiments. Therefore, and possibly due to the fact that their work had been published in a European journal that was hardly read and referred to in the U.S., their theoretical framework was soon forgotten.

*Many-world theories*. Some authors, most notably J. B. Hasted (1981), have suggested that macroscopic psi phenomena, like metal bending and disappearance-reappearance phenomena, could only be accounted for if the many worlds that are proposed to be created upon each quantum event in Everett’s solution of the measurement problem (Everett, 1957) could interact, that is, if an observer was able, by some yet unexplained “mechanism,” to go from one parallel world to another one.

The OTs were also born out of a solution of the measurement problem, namely the radical subjective solution stating that human consciousness is the ultimate measurement device. In CIRTS, by

virtue of not specifying quantum physics per se as the underlying time-symmetric formalism, there is no need to refer to the measurement problem. This is certainly an advantage because there seems to be growing consensus in the physics community that the whole measurement problem doesn't exist. On the other hand, phenomena where objects disappear in one place and reappear in another are difficult, if not impossible, to account for by CIRTS.

*Morphogenetic fields.* Sheldrake's (1988) formulation of the morphogenetic field theory was originally put forward to account for the development of forms in biology. One of the predictions was that forms, once created, would be easier to create in the future. In this formulation, the theory is essentially causal, which is even evident from the book title, *The Presence of the Past*. Indeed, Sheldrake, when suggesting that his "magic" fields could possibly also account for psi phenomena, focused on telepathy, and only recently has Sheldrake been considering precognition and other apparent violations of causality (Sheldrake, personal communication).

*Physics without causality.* Shoup (2006) has taken a more radical position by basically doing away with time at the most fundamental level. Just as in earlier work on Link theory, any physical formalism might be reframed in terms of reciprocal relations rather than in cause and effect. In such a framework, causality as well as retrocausality arises naturally. Although Shoup acknowledges the pervasive nature of time symmetry in physics, he focuses on time symmetry in quantum physics. His position is like CIRTS's, that in fact we do not need a radical alteration of physics to account for psi phenomena, but his theoretical thinking, unlike CIRTS, does not provide a link to psychologically relevant predictions.

### *Psychology-Inspired Theories*

*Noise reduction.* Honorton put forward the idea that internal and external "noise" suppresses the detection of "psi" information. Implicit here is the assumption that this psi information becomes available at the nonconscious level, if this level is not too busy with other processing, and might become available to consciousness if there is not too much external input. The ganzfeld procedure was thought to produce better results because it would partly remove this unwanted noise. There haven't been many studies directly comparing the ganzfeld induction with other induction procedures, so it remains to be seen if even this assumption is correct. Rather, better performance in the ganzfeld might be explainable in terms of ritual and possibly the relaxation process that often is an integral part of the ganzfeld procedure. Nonetheless, with CIRTS as a guiding theoretical framework one can speculate if noise reduction might lead to more coherent brain states.

It should be noted that Honorton's model is limited to telepathy, clairvoyance, and precognition, and belongs to the class of perceptual psi models assuming some kind of perception-like scanning of the environment using a nonsensory channel for information that subsequently is used to drive the subject's behavior. The information processing requirements to scan everything everywhere in past, present, and future and subsequently select that which suits, are so incredibly large that these models can hardly be taken seriously.

*Conformance behavior model.* In Stanford's (1978) conformance behavior model, all psi phenomena are "explained" as the consequence of biasing of random events that eventually drive the phenomenon. This unifying proposition seems to be borrowed from the observational model developed a few years earlier by Walker (1975). Walker used the idea of "symmetry of information flow" originally formulated by the quantum physicist Eugene Wigner to argue that observation (getting information) about a random event should have a counterpart of information flowing into the observed system. Information input in a random system results inevitably in structure of the random behavior. However, psi-hitting as well as psi-missing can be the result of a structural difference from pure randomness. So what determines the direction of the effect? The direction-giving concept that Walker introduced was called the "will channel." Stanford introduced the "disposition" of the organism as the concept that directs the biasing of the random processes. Although Walker's concept of will channel rested on formal and physical arguments, the "disposition of an organism" remained a very fuzzy construct that has hampered any progress based upon the conformance behavior model. It should be noted that Stanford's discussion of information flow is naïve. Thus he maintains that his model is not based upon some flow of information. However, biasing of random events is identical to information input. Since Stanford explicitly fails to indicate *how* the biasing of a random event occurs, but only "that it occurs," his model is based upon some unspecified flow of information driven by "disposition" into the to-be-biased system.

The current proposal, CIRTS, shares the unifying character of Walker's and Stanford's theories. However, it differs fundamentally on the core issue because no new physical principles, such as "reversed information flow" or "disposition driven biasing" are being introduced. Time symmetry is

an accepted physical principle whereas “information flow symmetry” and “biasing according to disposition” are not generally accepted.

The issue of information flow itself is also different in CIRTS. For sake of convenience, let us restrict ourselves to the time symmetry that is occurring in the brain. Time symmetry gives rise to retarded and advanced waves. These waves, which in the brain might represent information, are highly correlated and hence they appear to produce information transfer (from the past to the present). That is because *practically* the retarded wave, where cause precedes effect, is the one that drives human behavior in almost all cases. Therefore we tend also *conceptually* to attribute primacy to the retarded wave and somehow see that wave as the (information) source for the advanced wave. This is, however, a conceptual error. There is no information transfer with a transmitter, a transmission channel, and a receiver of information. Past and future conspire together in the present. Since it is conceptually so difficult for us to abandon the idea of information flow and traditional causality, a mathematical framework for CIRTS is long overdue.

The comparison with these two theoretical approaches does point to a potential shortcoming in CIRTS, especially in the still undeveloped part concerning apparent physical anomalies. The global argument that the advanced solution corresponds to a breaking of the second law of thermodynamics can explain apparent anomalous structure in physical systems. For instance, temperature might *increase* whereas it should be stable in normal circumstances. But temperature *decrease* would also be anomalous in that case. What determines the direction, up or down?

Many experimental outcomes in the psi literature can only be accounted for in the CIRTS framework by assuming (retroactive) PK by the experimenter. In that view, the experimental system with equipment and subjects is considered to be one big random event generator run by the experimenter. In such a case, we can explain anomalous structure in the dataset by referring to the breaking of the second law, but why would the structure correspond to the experimenters intentions? Within CIRTS, “intentions” at present do not play any role in getting anomalous effects. In CIRTS it is totally left open how intentional aspects of the subject eventually are reflected in the creation of anomalous correlations. The only psychological aspect that CIRTS deals with is the state of consciousness that would be optimal to create such a correlation. A model for “psi-missing,” for instance, is far beyond the current scope of CIRTS, but CIRTS might be augmented by more psychologically founded models.

*Altered states of consciousness.* In general it has been argued on the basis of incidental observations but also on the basis of questionnaire data that psi might be stronger if subjects are in an altered state of consciousness. CIRTS gives a framework to discuss these “optimal states.” For instance, assuming that some meditative practices might result in more coherent brain states, CIRTS would predict stronger effects with experienced meditators. Or if hypnosis were used to create a dissociative state, such as one in which pain is eliminated from the conscious experience, then we might expect smaller effects. For the more general state of hypnosis in which no explicit dissociative instructions are given, no specific predictions can be made. The dream state seems to be at least a receptive state for time anomalies to arise. We should make a clear distinction between the source of the advanced wave being a state that basically is the state during feedback or confirmation and the state where the effects of this advanced wave are strong. We suppose that for the latter (receptive) state, “lability” is a more important factor than “coherence.”

## PREDICTIONS

### *Physical*

If the Wheeler and Feynman argument holds that time symmetry is broken due to the lack of multiple particle coherent absorbers, it might be worthwhile to see if time symmetry is restored when interactions occur with a physical system that is known as a Bose-Einstein condensate. These multiparticle systems are stable only at extreme low temperatures. They exhibit a total coherence in which the individual particles lose their individual character and behave as an indistinguishable whole. Interestingly enough, a few decades ago, Ian Marshall proposed that consciousness arose from a Bose-Einstein condensate in the brain (Zohar, 1990).

It seems that Bose-Einstein condensates also arise at cosmological scales. Thus one could expect time-symmetrical effects to arise in cosmology too. Possibly, cosmological correlations with psi effects, such as, for instance, reported by Spottiswoode (1997), might be related to cosmological time symmetry. Also, one could expect time symmetry to be restored if large scale (global) coherence of many people’s minds would occur. This might happen during global meditation events or other events that seem to unite the world like those of 9/11. Thus we would predict time-symmetrical effects to be visible in the Global Consciousness Project data (see <http://noosphere.princeton.edu>).

*Psychophysical*

*Form-time symmetry in presentiment.* Presentiment experiments offer the most direct way to test time symmetry models. As was discussed in the data section, incidental observations of double peaks in the response part of a simple stimulus-response experiment sometimes seem to have a double bumped counterpart before stimulus exposure. This can be tested formally by using sometimes one and (randomly) sometimes two stimuli separated by an interval of say 2–3 s (see Figure 4). It should be noted that it is not possible to test this hypothesis in already available data because potential increase in bump frequency before and after the stimulus can be caused by a common factor of increased lability, the tendency of the body to produce spontaneous bumps in the skin conductance.

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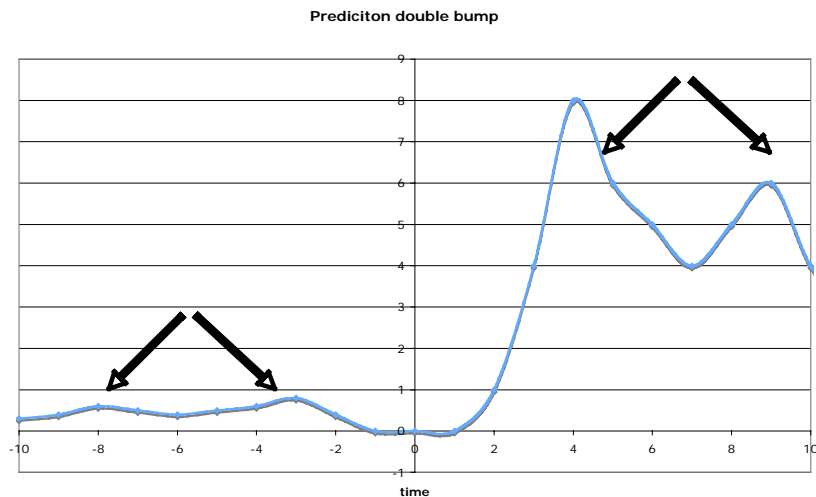


Figure 4. Predicted double bump presentiment effect if two arousing stimuli are exposed within a few seconds

*Psychological*

The predictions that can be made for psychological effects all have to do with the fundamental assumption that brain coherence is the crucial factor to restore time symmetry. Thus, effects of certain mental exercises or induction procedures might be predicted, as well as effects of specific personality traits insofar as these can be related to brain functioning.

One of the most promising avenues would be the effect of meditation on psi. Recently an fMRI study with experienced meditators showed stronger presentiment effects in meditators, as was predicted by CIRTS (Bierman, 2008). Radin (2008) did an experiment in which subjects were supposed to influence the passage of photons in an interferometer. Only the experienced meditators succeeded and did so with a very large effect size.

## DISCUSSION

Progress in science is fastest when a theory predicts phenomena that subsequently can be tested. Especially when the theory has some flexibility and when it cannot account for the phenomena, it can be updated according to new findings. It has been argued, mostly by skeptics, that parapsychology has no such theories. This is not quite true; there are many theoretical frameworks around but they are either purely physical in nature or they tend to be of a general psychological nature. The current theoretical framework, CIRTS, tries to bridge this gap in such a way that the multidisciplinary approach of psi phenomena finally gets a theoretical basis.

The impetus for this work was the remark by a mainstream researcher at the Bial symposium “Beyond and Behind the Brain” in 2008 that he was impressed with the psi data and the improvement in methodological quality but that the data were nothing more than a curious set of anomalies if there wasn’t theoretical framework to accommodate those data. Often, similar remarks have been interpreted by the parapsychological community as an escape argument. However, mainstream researchers who find effects for which there is no theoretical framework have the very same difficulties in publishing as the parapsychological research community has.

A theory, albeit one in “statu nascendi,” that makes explicit predictions about physical and psychological effects therefore could accelerate the acceptance of the field of parapsychology. Psi phenomena, rather than being defined as everything that we can’t explain, could then be defined in a positive way as phenomena in which physical time symmetry is restored. The present author has no illusion that the current formulation of CIRTS is even close to a definitive model. There is still some considerable “hand waving” that there are too many loose ends, but rather than waiting for all these to be tied together, I have presented the current preliminary framework because already in its current formulation it produces several testable hypotheses. That is something the field of parapsychology needs in order to make progress.

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