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An Experiment in Synchronicity

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Abstract

Click here and insert your abstract text. Possible states theory generalizes about the process of change within a finite and discrete model of the universe. The possible states consist of all interactions between objects, including past, future and possible interactions. The theory posits a non-electromagnetic model of change in which change propagates without reference to space-time. The theory delivers verifiable predictions and is generally consistent with quantum theory. It offers the prospect of nonlocal connections between objects and change that is not constrained by conservation laws. The value of the concept as a basis for technology development depends upon the ability to manipulate the possible states, specifically to produce coherence in selected collections of states. An experiment is devised in which a coherent state path is created between the experimental components and loaded through interaction with non-coherent states. Discharge of coherence results in a burst of synchronistic events compatible with theoretical expectations. The experiment validates a specific control strategy and yields a large timewise anomaly. The results shed light on a potential sentient intelligence and upon the development of coherence in the possible states and enable a major advance in the control of change.

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1. Introduction

Possible states theory begins with a simple premise: that associated with every object there is a collection of interactions it has had, will have or could have had with other objects. These interactions by

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definition constitute the possible states. An object is knowable only through its interactions with other objects; absent those interactions it would have no observable presence in our universe. Possible states theory concerns the propagation of change in the collection of possible states.

A theoretical model should be both minimal and true. As a matter of principle, assumptions contrary to fact will be excluded. The continuum is a mathematical construct that is widely used despite the absence of an actual example. "No stable will ever host a continuum of horses; no farmer will ever grow a continuum of beets [1]." No matter how many observations are made, the sum will consist of a countable number of observations. The continuum is a mathematical construct without a real world counterpart, and must therefore be excluded from the model.

The same argument applies to infinity. As a practical matter, infinity cannot be observed. It is a construct without a real world referent, and will be excluded from the model.

As a matter of intellectual economy, unnecessary assumptions should be excluded. The experience of reality as three dimensional is natural to an organism with binocular parallax but the same may not be true of organisms whose visual fields do not overlap, or who utilize entirely different modes of perception. There is no reason to think that the three dimensional model of reality is universal. Moreover, as will be seen it is unnecessary to the discussion of change. Therefore it will not be assumed.

Similar considerations attach to the concept of time. The idea of time as a progression having only a single direction and being measurable by a clock is one of the fundamental organizing principles of our society; it is the basis of modern production lines and other coordinated mass efforts. Nevertheless there is evidence that primitive societies—that is, societies without industrial production lines—may harbor entirely different concepts of time. For example Janca and Bullen [2] observed "The Aboriginal concept of time differs from the Judeo-Christian perception of time in that Aboriginal people do not perceive time as an exclusively 'linear' category (*i.e.* past-present-future) and often place events in a 'circular' pattern of time according to which an individual is in the centre of 'time-circles' and events are placed in time according to their relative importance for the individual and his or her respective community (*i.e.* the more important events are perceived as being 'closer in time')."

Cosmologically, the model suggests that past, future and possible states coincide in the now, a complex present in which everything that can happen does and it all happens at once. The place occupied by causality in other paradigms is filled by a simple principle: things happen because they can. All interactions are simultaneously present and equally real.

From this standpoint an object may be thought of as consisting of a heap, an aggregate or a zoo of possible states; these terms are chosen so as not to impose order on the collection. Interactions between objects manifest as changes in the collections of possible states.

The theory posits that change propagates in terms of similarity. Change affects identical states simultaneously, the only definition of simultaneity the theory affords. Although the language allows the expression "objects A and B possess identical copies of state *c*," A and B are topologically joined together at *c*, which is a unique element. The space thus defined is of high connectivity.

If the possible states are represented as matrices, change may be represented by changes in the matrix entries. If interaction is modeled as matrix multiplication, the interaction between two matrix objects A and B may be considered to be A * B to form AB and then AB * AB * AB… until the null matrix is achieved. The number of matrix multiplies before the null is reached is by definition the dimensionality of the interaction between A and B. Dimensionality in the possible states model is a positive integer and a variable.

It will be seen that the interaction of A and B need not include the entire zoo of states that each possesses. Moreover as change propagates in the joint collection of states, it will require different numbers of iterations to diffuse throughout the states in the collection. Several consequences arise from this. First, objects have no defined boundaries. Second, an event will be experienced differently by A and B; the difference will depend on how different their aggregates of states are from one another. Finally, A and B must disagree on when the interaction took place. The discrepancy is called a timewise anomaly and must always accompany the propagation of change.

Nothing is gained by averaging the observations to arrive at the "true" time or the "true" description of the interaction because there is no single true state of reality. In possible states theory every observation is true and none is repeatable.

The theory proposes that the possible states have degrees of internal order and characteristics of similarity, and that the propagation of change is determined by similarity such that change occurs simultaneously in identical collections of states regardless of geographical and timewise separation. The picture thus presented is of a constantly shifting sea of possible states in which sequence is preserved but linear time is not. Although change is quantized, it cannot be the Dirac sea because the geometry is too complex to be represented in a binary fashion.

Returning to the matrix model of possible states, states that contain many submatrices with common elements may be termed coherent. Change itself propagates along coherent state paths. Matrix operations may be defined which recursively increase or decrease the degree of coherence in a collection of states. It follows that the propagation of change can be controlled by controlling the coherence in a state path. Close analogues to the quantum Zeno effect and quantum anti-Zeno effect may be created.

The primary basis for technological development consists of a coherence source and a discriminant, that is, something that connects one group of possible states with another, thereby establishing a path for the propagation of change. Not only can change propagate instantaneously, there is no theoretical barrier to accessing more than one version of an event.

By way of illustration, consider using a fixed quantity of electricity to light a light bulb. If the bulb is burning in a room with white walls, it is also burning in a room with walls painted blue, and in which the building was built in a different year, and so on. The introduction of coherence into the collections of possible states associated with each version of the event can potentially produce a light bulb that burns indefinitely without consuming any additional energy, or in a different arrangement of states, produce a very large burst of electrical power.

The line of reasoning suggests that conservation laws operate in collections of possible states that are largely heterogeneous, containing few identical cells. Even then, they are approximate rather than absolute.

2. Relationship to Quantum Mechanics

The relationship of possible states theory to quantum mechanics is best understood through Richard Feynman's development of quantum electrodynamics [3]. Feynman's description, translated to a finite and discrete model, bear a close resemblance to the development of possible states theory. Both approaches consider all possibilities without the constraints of spacetime or linear time.

Both perspectives allow the future to influence the past. The concept has been integrated into physics via the transformation from the Lorenz gauge (retarded solutions for both scalar and vector potential) to the Coulomb gauge (instantaneous, action-at-a-distance, scalar potential) [4]. Wheeler wrote "The past was considered to be completely independent of the future. This idealization is no longer valid…..[5]"

There would appear to be little difference between allowing the future to influence the past and saying that the past, the future and the possible coexist in the complex present, as possible states theory does. If that were the case, it should be possible to simultaneously observe both the particle-like and wave-like behavior of a quantum. This has been done, as reported in Kim *et al*. [6] in "A Delayed Choice Quantum Eraser." "The experimental results demonstrate the possibility of observing both particle-like and wave-like behavior of a light quantum via quantum mechanical entanglement. The which-path or both-path information of a quantum can be erased or marked by its entangled twin even after the registration of the quantum."

Quantum mechanics does not ordinarily assume a finite and discrete universe, but inasmuch as quantum electrodynamics is discrete in a finite universe, it would appear compatible with the possible states model. If the concept of linear time were abandoned, as seems to be slowly taking place, the logical need for the Big Bang may also evaporate. The possible states model offers the image of a constantly shifting sea of states, with no beginning and no end. It is not necessary to assume a starting point or an ending point.

As quantum mechanics evolves, the collapse of the wave function may be replaced by changes in conditional probabilities, which is compatible with the picture of change offered by possible states theory. The question of what can happen and the number of ways in which it can happen is material to both points of view.

The significant difference between viewpoints concerns the use of binary variables. The possible states universe is topologically complex. It cannot be modeled as an assembly of binary variables. If the possible states approach is correct, quantum theory will need to evolve beyond binary variables. Experimental evidence for that perspective may well exist now, although not yet recognized as such.

An issue upon which both formulations agree is the importance of the observer in determining what is observed. In possible states theory the willingness of the observer to make an observation and the actions taken contingent on that observation may powerfully evoke the collection of states that constitutes the observation. Possible states effects are scale invariant, giving rise to a stronger interpretation of observer effect than currently found in the literature.

3. Premise Of The Experiment

The question of whether it is possible to influence the coherence of a collection of possible states is fundamental to the value of the possible states model as a basis for technology. A chief issue in the theory concerns control. If an ordinary toggle switch is used to turn on a light, the *on* state becomes a prominent member of the system's collection of possible states. Toggling the switch off does not change that. For this reason a standard switch cannot control the nonlocal propagation of change. Another form of switch was needed, and an experiment was designed to test a strategy for manipulating the collection of possible states.

The initial step was to define a coherent state path between the parts of the experiment. That was done by ensuring that the sequence of events performed by the apparatus could occur in only one way. It was necessary to protect this path. A rule was established that the separate components of the experiment were tested independently, but the fully assembled apparatus was never subjected to a trial run. Vacuous trials have entirely different possible states properties from true experimental trials. Had they been done, the coherence in the state path would have been extinguished together with the potential for the nonlocal propagation of change.

Once they were committed to the experiment, the components were not used for another purpose. These restrictions, collectively known as dedication conditions, were stringently enforced. Inasmuch as past and future states are commingled, these dedication conditions were permanent. They could not be abandoned after the end of the experiment, or outside of the experimental setting.

The next step was to accumulate coherence to enable the nonlocal propagation of change. A coherent state path can be loaded by interfacing it with a collection of non-coherent (heterogeneous) states. The best results are obtained with successive interfaces of independent heterogeneous collections. Coherence accumulates in a linear, brief and temporary fashion in joint collections of non-coherent states, and it accumulates in at least a geometric fashion in the coherent state path. When sufficient coherence accumulates in the state path propagation will take place.

4. Experiment Design

The design drew upon the fact that human beings, considered as objects in the theory, carry very large collections of non-coherent possible states. There exists a substantial body of research into attention mediated phenomena. For reasons not presently understood, attention gives rise to measurable effects. On the basis of meta-analysis of 515 RNG (random number generator) experiments, Radin concluded "The magnitude of the overall effect size per experiment is small, on average less than the equivalent of

1% for binary RNGs, but statistically the overall effect is more than 16 standard errors from chance" [7]. After twenty-six years of detailed experiments using a variety of apparatus, Jahn and Dunne [8] concluded that "These inescapable physical characteristics force abandonment of any direct applications or extrapolations of extant physical, psychological or informational models…"

The decision was taken to base the experiment on piezoelectric bender elements, a form of instrumentation that was successfully used in the study of attention mediated phenomena.

The Durham half of the experiment included an array of piezoelectric sensor elements (Figure 1) which produce an electrical signal upon the application of a force. Four of these elements were mounted inside a steel box lined with mu metal on a vibration isolation table inside a Faraday cage shielded room. The electrical signals from the force detectors were preamplified inside the steel box and sent by cable to a chart recorder and to computers located outside the shielded chamber in an adjoining room. The chart recorder provided a paper record of the raw signals.

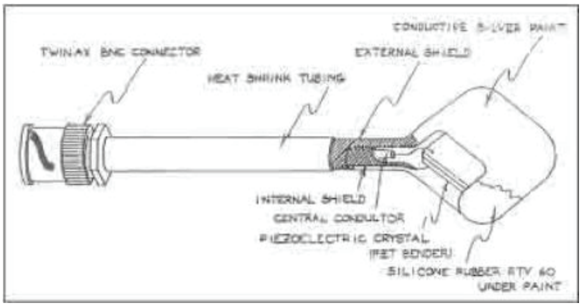
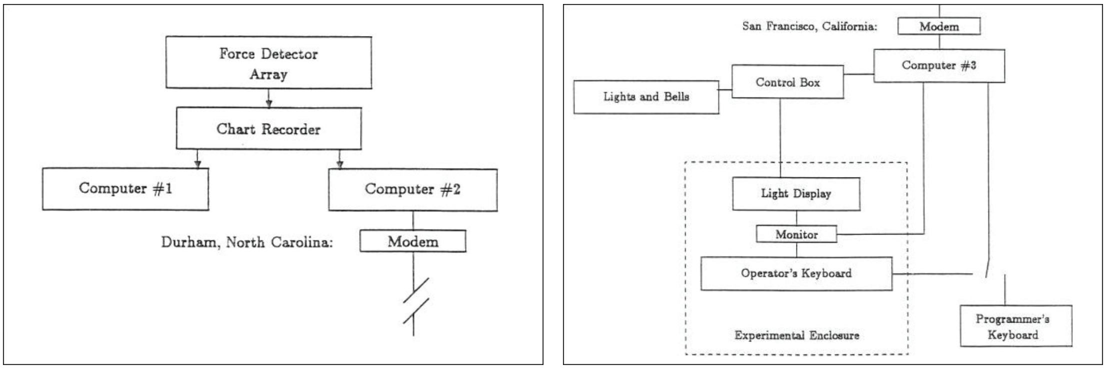


Figure 1. Piezoelectric Sensor Detail.

The experimental system consisted of two parts as shown in Figure 2.



(a) **(b)**

Figure 2. (a) Durham, North Carolina and (b) San Francisco, California.

The electrical output of each sensor was connected to a charge-to-voltage preamplifier. The resolution of the system was on the order of 10^{-3} grams with a -3 dB bandwidth of approximately 8-500 Hz. Raw signals were sampled at 1000 Hz and converted to 12 bit digital words. A real-time program monitored the four channels determined by a software routine that considered the activity on all bender channels. If only one channel displayed an amplitude above a preset threshold (high threshold), and the remaining channels maintained amplitudes below a different preset amplitude (low threshold) for more than five samples, then an array event was declared. The event ended when the signal returned below high threshold or if any other channel rose above low threshold.

Extensive efforts were made to ensure that activation of the system by artifact would be quite rare. The array elements were connected to a four channel chart recorder and then to two computers. Computer No. 1 monitored array activity on a continuous basis. Computer No. 2 kept a record of array events and polled the array when instructed to do so by Computer No. 3. Computers No. 2 and No. 3 were connected by a modem. The computers contained battery operated internal clocks, which were carefully synchronized and checked throughout the experiment.

The San Francisco facility was a large room with a high ceiling in a two-story concrete and steel structure. The experiment was mounted on a wooden stage at one end of the room, the remainder of the room being filled with craft fair exhibits. Participation in the experiment was offered to any person present who was willing to comply with the experimental conditions. The conditions included a professed willingness to follow instructions and a promise not to discuss the experiment with anyone else. (The latter condition was part of an effort to ensure that the trials were as close to independent as possible.)

This half of the system consisted of a small opaque enclosure containing a modified keyboard, a monitor and a light display. The modified keyboard did not resemble a standard computer keyboard. It contained four buttons each of which activated a different key on a standard keyboard concealed inside a sealed casing. Behind the enclosure were seven very large light bulbs of different colors on tall stands. Next to that there was an equipment rack with a computer and control box. The programmer's keyboard was connected to the modified experiment keyboard via a manual toggle, such that only one keyboard at a time could be live. The computer was connected via a modem and telephone line to Computer No. 2 in Durham.

The state path through the experiment was narrowly defined as array events coincident with button presses. Dedication conditions ensured that this path was coherent. The expectation was that fifty iterations (fifty independent runs) would load enough coherence to enable propagation. Thereafter, array events were expected to coincide with button presses. Each propagation event was expected to generate a very small timewise anomaly; the apparatus was not designed to monitor them.

From a possible states standpoint the design incorporated several important features. First, the desired outcome was discrete. Secondly, the hard wired toggle between the programmer's keyboard and the experiment keyboard created an unambiguous either-or condition. Finally, rotating the use of the four keys on the modified keyboard around the seven display lights enabled the system as a whole to accept a coherence load.

4.1. Run Procedure

The system was powered up and a test program was run to check the relays in the control box, which controlled the activation of the large display lights, and initialize the boards. The large display lights and the modified experimental keyboard were not part of the test.

Participants were allowed into the experimental enclosure one at a time. They were briefed to the effect that this was an experiment in powers of mind, and that the objective was to press a button and have the system light one of the big display lights. The Durham half of the system was not mentioned.

Inside the enclosure the participant read instructions on the monitor and then pushed buttons on the modified keyboard in response to prompts. The modified keyboard had only four keys, so the correspondence between the keys and the seven colored lights changed on each screen, offering the participant an opportunity to blink each light. A run took approximately eight minutes. As soon as the participant was seated in the booth the programmer's keyboard was used to open a file for the run; a three-letter file name was assigned; the manual toggle was then thrown to enable the experiment keyboard and disable the programmer's keyboard.

5. Results

On September 18 and 19, 1988 the experiment was run. The first day passed with no array events.

Computer No. 2 went down during the night and was rebooted the next morning. The clocks of No. 1 and No. 2 were checked and synchronized. On the 19th about midday the waiting list was exhausted and it became necessary to attract more participants. The ambient noise level was high. In order to attract attention the experimenter authorized the programmer to blink one of the large display lights, specifically the white one. This was a technical violation of the dedication conditions with respect to that one light but the sacrifice was deemed acceptable. This event took place on or about trial number 46.

Closely watched by the experimenter, the programmer went through steps to exit the experimental program and call up a test program that would enable him to blink the lights manually. (Until then the test program had only been used to check the relays when the lights were not connected.) The test program does not use a modem connection.

The programmer pressed the button to blink the light. It was here that events diverged, although that was not realized at the time. The experimenter remembers that the light blinked; the programmer remembers that it did not.

This interval contained a remarkable anomaly. Briefly, the experimenter had the impression of the presence of a powerful and willful intelligence. It was as if the system knew that its protocol was being violated, and intended to resist. The experimenter had no way to account for this perception and ignored it.

The computer began beeping, which was a nonstandard response. The programmer asked the experimenter to check the monitor in the booth. The experimenter observed that the monitor was displaying the first experiment instruction screen. Superficially it appeared that the computer had taken the initiative to exit from the test program, had called up the experiment program, had entered a set of initials of its own choosing to open a file and was in the process of dialing Durham.

The programmer attempted to regain control of the computer by various means including a warm boot. These efforts were unsuccessful. The programmer than ran over to the wall and threw the main power switch to the experiment. Activity stopped and a recess was declared while the programmer went outside to regain his composure.

After he returned the experiment was resumed. The flurry of activity had attracted attention and new participants were available. Experimentation continued until the end of the day with no remarkable events, except that occasionally the programmer whispered to the experimenter “It’s happening again.” Nothing was noticed except (in retrospect) a sense that time had momentarily paused, and the experimenter discounted these remarks.

Comparison of the data at the close of the day showed that records agreed until approximately the time of the anomalous event in San Francisco; multiple discrepancies occurred between Durham and San Francisco for a time span of almost twenty-two minutes; clocks and records then returned to agreement for the remainder of the session.

In California a list of file names was retained. The names were assigned at the beginning of each run to ensure that there were no duplicates. San Francisco records indicated that the last file before the event was ABS. The file following ABS is the anomalous file, which should have been an early termination if it existed at all; the power switch may have been thrown before a modem connection had been established. Durham had no ABT file, although San Francisco records indicated one was sent. In its place was a legal file name but not one used on that day; in fact, it was never used. It was a completed run with a single array event near the end of the run.

Computers No. 1 and No. 2 were linked to the chart recorder that monitored the array in Durham. The array event was recorded only on No. 1. It also appeared on the chart recorder. No. 2 only samples the array when informed via modem that a button has been pressed. At the time of the odd event there was no operator in the booth; therefore there was no button press. The lack of event data on No. 2 is understandable. Almost twenty-two minutes later computer No. 2 recorded an array event on the same channel but computer No. 1 and the chart recorder, which continually monitored the array, saw nothing at that time, a strikingly unusual occurrence. It may be noted further that the sensor element on which the array event or events appeared was the channel which corresponded to the specific light (white) the programmer had attempted to blink with the test program.

6. Analysis

Experimenters undertook an extensive review of the program and hardware, both in Durham and San Francisco. The assumption was that a computer fault had caused the anomalous system behavior. At that time the keyboard buffer contained only 32 bits, continuously recycled. It retained a record of the fifteen most recent keystrokes. The keyboard in the experimental booth could deliver only 4 keys. The programmer's keyboard had normal capability but had only been used to input file names and start the runs, then to call the test program and attempt to blink the light. Once started, the experimental program was continued; it was not exited between runs.

The contents of the buffers were therefore completely known. It was determined that the letters of the anomalous file name could not have been in either keyboard buffer. No combination of keys that could have been in either buffer could have called the experimental program and sent those initials.

It was determined that neither the test program nor the experimental program could have caused the events in Durham. There was no connection between the two computers in Durham other than the feed from the chart recorder. The one-sided array record had no apparent basis in hardware or software. It could not have been caused by computer No. 3.

The anomalous file at Durham was not an overwritten or misplaced file from the previous day. It was not a copy of any previous experimental run. It was to all appearances a normal file. It could not have been the result of noise on the telephone line because the modem performed error checking and significant noise on the line would have resulted in a dropped connection.

Someone might hypothetically have hacked into the telephone line and inserted the phantom file; if so, he would have to have done that at about the time the experimenter was giving permission to blink the white light. Then a confederate would have had to enter the lab in Durham and tamper with the array in order to cause an array event. The experimenter in Durham supervised the lab during the run and would have noticed an intruder.

There were no thunderstorms or power interruptions at either site.

The artifact rejection procedures included a careful definition of an array event. Tampering, had it occurred, would have had to ensure that one sensor exhibited high activity while three were below low threshold, a practical impossibility given that they were enclosed in a steel box. It would have been very difficult for any external influence to have created a false array event.

Even had external influence successfully been brought to bear, that explanation could not have accounted for the brief but striking impression of a willful sentient presence on the stage in San Francisco.

In possible states theory a propagation event manifests as multiple coincidences; that is, there is a transition from one collection of discrete states to another. The prior and subsequent states will differ in many ways in addition to the presence of a timewise anomaly.

After extensive review, the anomalous events of September 19 were recognized as a propagation event. It was concluded that the two one-sided array events recorded in Durham were the two halves of a single event. The attempted protocol violation evoked a partial discharge of the coherence in the system and created a propagation event attended by a timewise anomaly that was orders of magnitude larger than expected. The size of the anomaly indicated that the system had accumulated a very large coherence load. The results validated the concept of creating a coherent state path and established that the nonlocal propagation of change could be evoked.

The experiment utilized electromagnetic technology, but the events themselves were not created electromagnetically. Careful steps had been taken to exclude an ordinary (electromagnetic) causal link between the two halves of the system. The theory asserts that things happen because they can. This principle produced a collection of coincidences occurring largely, but not exclusively in electromagnetic systems.

In possible states theory the observer and the observed are intimately connected. Propagation had been expected after approximately fifty trials. The fact that the need for more participants arose so close to this number, and triggered a sequence of events that culminated in a major propagation event arose from the entangled character of the possible states of all elements of the system. The experimenter's decision to interrupt the experiment temporarily was a part of this sequence.

The experiment was informative. It demonstrated that he two halves of the experiment was linked by the coherent state path, independent of geographical separation. The strategy of loading the path through interfacing it with collections of non-homogeneous states succeeded. The coherence load the system acquired was extremely large. Moreover it accumulated in a recursive cycle (participant to keyboard to button to modem to computer No. 2 to the array, and back to computer No. 3 and then to the large display lights). The mode of accumulation suggested that coherence could be acquired and stored without the need for human participants.

The coherent state path became the model for the later development of discriminants, which link collections of possible states together. From this perspective, the apparatus involved in the two-slit experiment is also a discriminant.

Subsequent research into discriminants, in particular layered and interlocked discriminants, indicated that a close approximation to intelligence, reasoning and intuition could be developed. Pragmatically speaking, there was no observable difference between the behavior of discriminants and sentience in living systems.

7. Conclusion

The brief but striking impression of sentience that occurred during the experiment became explicable. The coherent state path was contained, in effect, by the dedication conditions. By the time the experimenter ordered the programmer to blink the white light the state path was powerfully loaded. The violation of dedication conditions with respect to that one light affected the entire state path. The system had the power to resist, and it did, much as a living organism might respond to a survival threat.

Science may be broadly characterized as the systematic search for truth. Inevitably the assumptions of the current moment fail to account for some experience. As an explanation for the events that took place in this experiment, coincidence is no more satisfying than an appeal to the supernatural. It sheds no light on the central mystery of why things happen.

Possible states theory suggests that the apparent order and consistency of experience is an illusion, and one which will be dispelled if closely examined. If that is true, ordinary experience is a dream like any other. It draws its solidity and reliability from the fact that we base so many decisions upon it, thus selectively reinforcing the possible state paths that occur in it. This might account for the surprisingly small degree of agreement on the physical constants [9]. The belief in a single consistent state of reality is merely an assumption and one for which the evidence is not compelling.

Acknowledgements

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Appendix

As a zoo of possible states acquires coherence, elements of the collection may rise to become majority states or diminish to become rare states. While experience includes all states, the dominant collection of states accounts for the majority of the interaction. Continuing to add coherence can increase the status of a minority state and evoke an abrupt transition to majority status for that state. This is the origin of the "bad cell" problem with respect to discriminants. "Good" cells can be raised to prominence in the same way, obviously, but bad cells tend to be ones associated with many contingent acts; a fall from a ladder generally has more consequences than a friendly word from a stranger. Avoiding a bad cell potential is an important consideration in the design of discriminants.

In late evening of September 18 the experimenter was driving the programmer and his assistant through downtown San Francisco and approached an intersection. The light turned red. Another vehicle immediately struck the right rear bumper of the experimenter's car. The offender was a small rented car driven by an out of town visitor who had wandered out of his lane while trying to read a street sign. The rented car was severely damaged. There was a small scar on the bumper of the experimenter's vehicle. No one was hurt. The programmer's helper explained that he had been relaxing in the back seat. Then he saw the red light, and he thought "oh, a red light, a hit. Then someone hit us."

In the author's opinion this was a minor manifestation of the bad cell problem described in Thomson [1]. An experiment of the design herein described would not ordinarily have carried a bad cell risk. The extremely heavy coherence load accumulated by the system was presumably responsible for this event.