PRECOGNITION IN EVERYDAY LIFE
–A PHYSICAL MODEL–

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INTRODUCTION

In the field of parapsychology, data pertaining to three general classes of perception are studied. These are: telepathy, which is mind-to-mind communication; clairvoyance, which is the perception of an event hidden from the ordinary senses; and precognition, which is the perception of a future event that could not be known through rational inference. Of these three phenomena, I believe that contemporary physics will find the least trouble in assimilating precognition. In order to understand this, one may want to reflect on the idea that "causality" is a fact observed in our lives or in the laboratory, and not a law of the universe. The present concern of physics with the possibility of information from the future leaking into the present is shown in the lead article in *Science* magazine of April 7, 1972. The paper, "The Crisis about the Origin of Irreversibility and Time Anisotropy," [11] begins with the following paragraph:

> An old crisis in science is receiving renewed attention . . . This crisis manifests itself most clearly when attempts are made to provide answers to such fundamental questions as: Is the origin of (time) irreversibility . . . local or cosmological? Is it in the laws or in the boundary conditions? What might be the physical interrelationships underlying the expansion of the universe, information theory, and the electromagnetic, biological and statistical arrows of time? What is the basic nature of the somewhat mysterious time coordinate system in which the very physical laws are embedded?

I agree with the author of that paper in his conclusion that irreversibility appears to be more "fact-like" than "law-like." This says that although information usually propagates from the present to the future, we should not be shaken to our foundations if experiments are devised that show that sometimes information is found to be transmitted in the other direction. Indeed, it is the symmetry in the solu-

tions to many physical equations that suggests the model to be presented here to provide a working description of precognition. This model will be described, along with some proposed experiments, to test its validity.

I also will show that precognition was not invented in the laboratory, but is found occurring naturally in the field. Precognition and its cousin, prophecy, have a long history of occurrence, which is well documented in spontaneously occurring recent cases collected by Louisa Rhine,[2] and in laboratory experiments by Soal and Bateman.[3]

PRECOGNITION AND PHYSICS

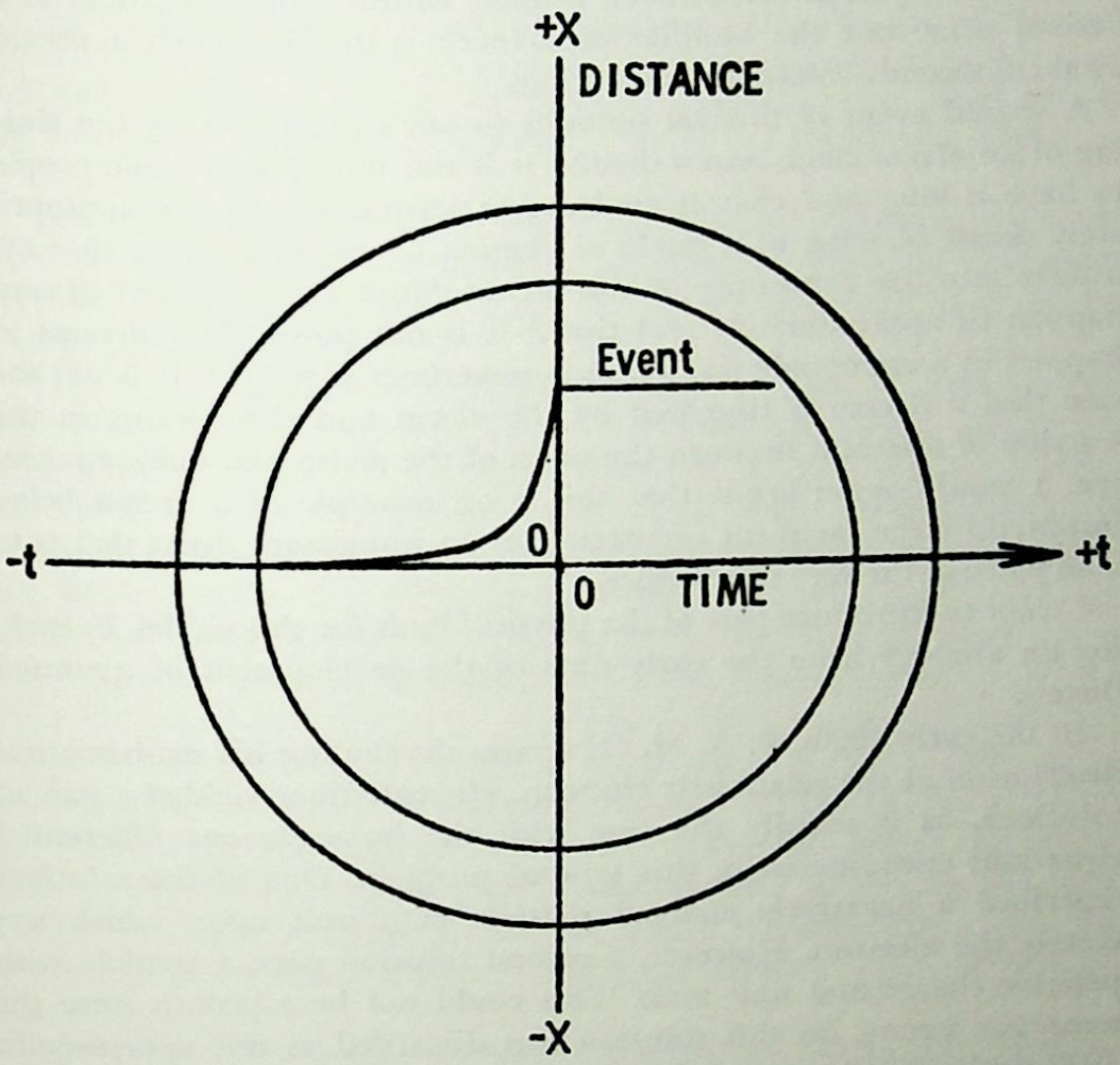
The reason that I believe physics will find precognition the easiest of the psychic phenomena to describe lies in the fact that in physics everything that is not forbidden occurs. And, as I have suggested earlier, physics does not forbid the transmission of information from the future to the present. The difficulty that one has in dealing with this problem is more linguistic than physical.

The hypothesis proposed here is that significant events create a perturbation in the space-time in which they occur, and this disturbance propagates forward and, to some small degree, backward in time. Since precognitive phenomena are very rare, this disturbance must die out quite rapidly in the $-t$ direction. The wave traveling in the $+t$ direction is associated with the usual causality.

Consider a coordinate system $-t$ to $+t$ perpendicular to the axis of $-x$ to $+x$. Such a system is often used to describe the temporal character of events, where x is the spatial coordinate and t is the time axis. If these axes are superimposed on a pond of water, with the origin (0,0) at here-and-now, future events will be at $+t$ and past events will be at $-t$, as shown in Figure 1. If this system is perturbed at the origin, a large effect will, of course, be created right in the neighborhood of the perturbation. Which is to say, that a rock thrown into the pond at (0,0) will give rise to ripples that will be discernible at some small distance $+t$ to $-t$, and $+x$ to $-x$. Now if the pond is filled with a material that is more viscous than water, the ripples may be very small indeed. However, it is unreasonable within the framework of this model to imagine a medium so viscous that a point perturbation at the origin would have zero effect at some small $\pm t$. I am postulating that physical events are not delta-functions in space and time. Moreover, if one is sufficiently close to an event, even though on the $-t$ side, there is no physical contradiction to its being perceived. The accuracy of the precognitive perception predicted from this model will increase

with the "magnitude" of the event for the perceiver, and it will fall off with increasing temporal distance from the event.

FIGURE 1



Space-time diagram showing a precursor wave in -t before an event

From this model, which I recognize does not yet deserve to be called a theory, one would predict that the most common events to be perceived by precognition would be events occurring extremely close in time to the perception of them. Also, if one is going to perceive something before it happens, it should be an event that is of sufficient magnitude to catch one's attention—the larger the better.

An example of such an event is the ringing of an alarm clock to awaken one. It is a common occurrence for one to awaken and look with surprise at his alarm clock, only to hear it click and then go off.

I believe that one is awakened by the incipient occurrence of this large, timely, and unpleasant event.

I am aware that sleepers have a surprisingly good time sense when trained or motivated to do so. However the most recent data of Tart [4] shows that a person can awaken himself within 5 or 10 minutes of a desired time, but the familiar occurrence is one in which a person awakens seconds before the alarm rings.

A second event of interest pertains to one's incorporating the ringing of an alarm clock into a dream. It is not unusual for some people to have a long and complicated dream terminated by the appropriately timed blowing of a bugle or ringing of an alarm clock that fits utterly into the continuity of the dream. Since we know that dreams happen in approximately real time,[5] it is not possible for dreams to happen in a retrograde fashion as is sometimes suggested. It is not the case that a dream is triggered by the alarm and then occurs in the fraction of a second between the onset of the alarm and one's awakening. I would again argue that this is an example of a dream being initiated by the incipient occurrence of an unpleasant event that is to take place in the very near future.

I want to introduce part of the physical basis for this model, by making an analogy from the early days of the development of quantum theory.

In the early 1920s, P. A. M. Dirac was developing his mathematical description of the relativistic electron. His equations yielded a pair of solutions, as is usually the case with the homogeneous differential equations encountered in this type of problem. One of the solutions described a negatively charged particle with unit mass, which was clearly the electron. However, a second solution gave a particle with positive charge and unit mass. This could not be a proton since the mass was wrong. So this solution was discarded as not applying. In 1932 Anderson discovered the positron in cloud chamber experiments, and Dirac's discarded solution became applicable.

In our case we are concerned with the perception of an event occurring at a time in our future. A set of equations that might be used to describe this situation are the equations for the field at a distance r from a moving charge (corresponding to the perception, at a distance r and a time t, of an event). These equations also give two real solutions, one of which is conventionally discarded as not corresponding to any physical observable.

In Stratton's graduate text, *Electromagnetic Theory*,[6] the author describes the choice of solutions for the moving charge equations as follows:

The reader has doubtless noted that the choice of the function $(t + r/v)$ is highly arbitrary, since the field equation admits also a solution $(t - r/v)$. This function leads obviously to an advanced time, implying that the field can be observed before it has been generated by the source. The familiar chain of cause and effect is thus reversed and this alternative solution might be discarded as logically inconceivable. However the application of "logical" causality principles offers very insecure footing in matters such as these and we shall do better to restrict the theory to retarded action solely on the grounds that this solution alone conforms to the present physical data.

This seems like an entirely appropriate course of action, since we, now thirty years later, would like to propose that there do exist some physical data that can make good use of the advanced time or advanced potential solution.

This model predicts the following general chain of events: One moves steadily along the time axis at the usual rate of one second per second, from $-t$ toward the origin where an event is about to occur. As one encounters the tail of an incipient event from the left, as shown in Figure 1, one is increasingly likely to perceive the event, until one finally reaches the origin and the event occurs. In terms of the advanced potential model, an observer at $-t$ will be encountered by a wave, or interference pattern caused by waves converging on the origin from the left (large values of $-t$). When these waves encounter the observer, he will perceive the event. Subjectively, he will believe he is remembering it. He will continue to do so until the packet of waves has passed him, at which point he will subjectively forget the event. The event will then happen, making the observer believe he had seen it all before, which indeed he had. We would therefore argue that the familiar déjà vu phenomenon is the most common form of precognition.

If the observer is to perceive the event a few seconds before it occurs, it is necessary that the information carried by these proposed precursor waves be propagated at a velocity less than c, the velocity of light. Since the waves themselves may travel at c, we assume that the information is carried as a traveling-wave interferogram or time-varying hologram. That is, the information propagates at the velocity of the interference pattern in the wake of the passing waves, rather than at the velocity of the waves themselves. The phase velocity of this signal would, in this case, be slower than the group velocity, c. This allows an extended interaction time which is more or less independent of the spatial distance between the observer and the event.

VERIFICATION OF THE MODEL

In order for a model such as that proposed here to be worth considering, it must be quantitatively testable. In the following, I will describe the experiments that will be performed to determine the correctness of certain aspects of this model.

The most easily testable part of the hypothesis is the idea that the accuracy of precognition decreases with temporal distance from the event.

We have already performed clairvoyance and precognition experiments with an ESP teaching machine [7] whose purpose was the enhancement of ESP ability which we assume to be latent to some extent in all people.[8] The enhancement is accomplished by allowing the user of the machine to become aware of his own mental state at those times when he is most successfully employing his extrasensory faculties. Only with increased reliability of ESP functioning can we find the functional relationship between ESP and more familiar physical and psychological variables.

The teaching machine we used to accomplish this automatically and randomly selects among four targets for the user to choose. A target is chosen by the machine and is not presented to the user until he has indicated to the machine what he believes the target to be. The targets are 35 mm color transparencies and the user's task is to select the one the machine has chosen by means of its random generator.

An important feature of the machine is that the choice per se of a target is not forced. That is, the subject may press a PASS button on the machine when he does not feel he knows the correct choice and wishes not to guess. Thus, with practice the user can learn to recognize those unique states of mind in which he can correctly choose the target. When the PASS button is pushed the machine indicates what its choice was, and neither a hit nor a trial is scored by the machine, which then goes on to make its next selection. We consider this elimination of forced choice to be a significant condition for learning ESP.

When the user of the machine indicates his choice to the machine, he is immediately and automatically informed of the correct answer. The machine described thus far would be used to enhance clairvoyant perception in which the experimenter and the subject remain ignorant of the machine's state until the subject has made his choice.

The protocol for the experiment was for the subject to make four runs of 24 trials, ($P = 1/4$). This was followed by a rest period, and four more runs of 24.

The most successful subject in a group of eleven made a total of 64

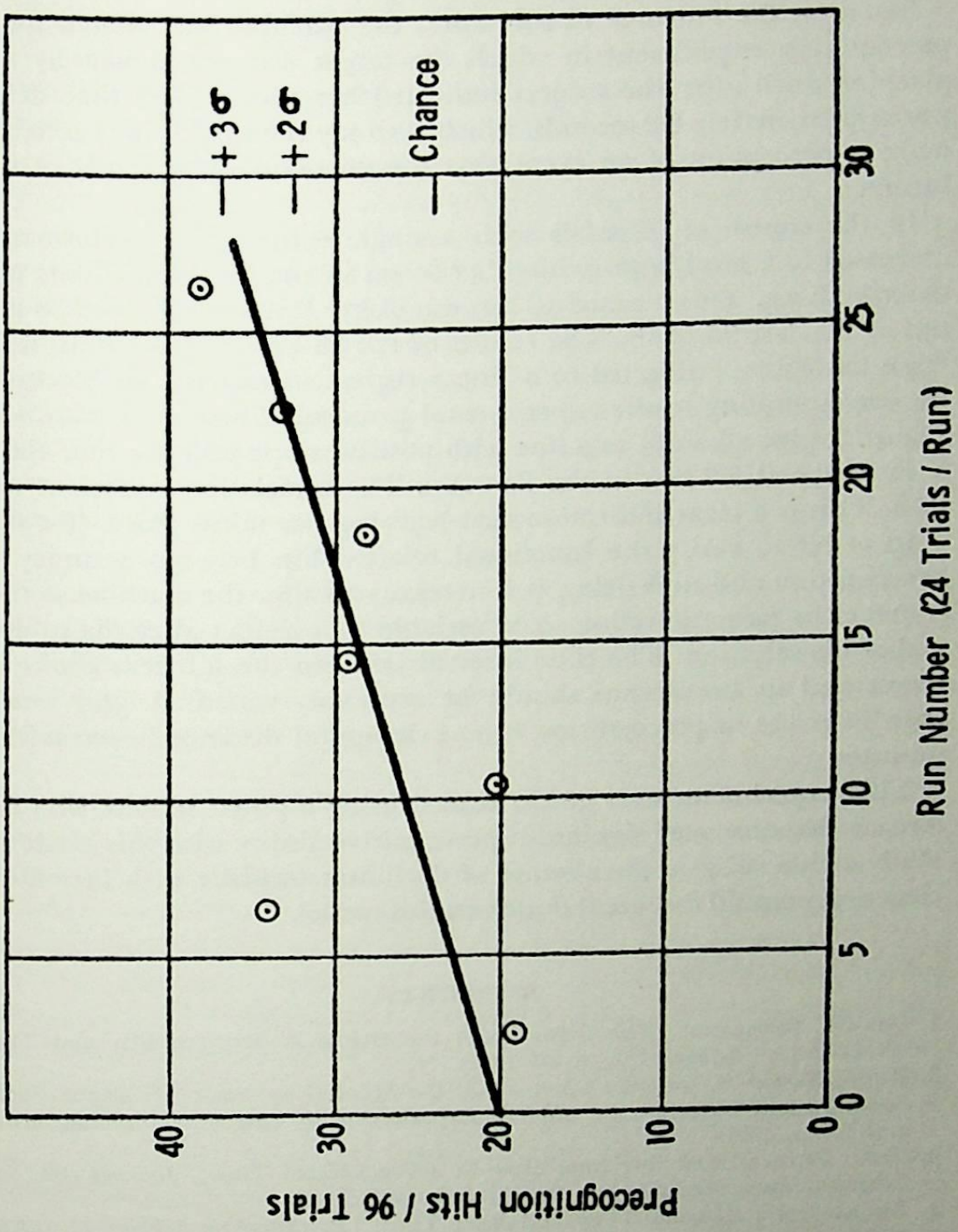

+3σ
+2σ
Chance
Precognition Hits / 96 Trials
40
30
20
10
0
0
5
10
15
20
25
30
Run Number (24 Trials / Run)

FIGURE 2

runs of 24 clairvoyant trials with a mean score of 8.6 hits per run. (CR = 9.8, P for the whole series $<10^{-15}$)

Based on the outcome of this work, the machine was altered for a precognition experiment in which the target was not chosen by the machine until after the subject indicated her choice. The time delay was approximately 0.2 seconds, which is to say the subject was asked to make a perception of an event that was to occur 0.2 seconds in the future.

In the course of 62 trials with a single subject, her performance increased to a level approaching her scores in the clairvoyant tests just described; e.g., she obtained 19 hits out of her first 96 trials, and 38 hits out of her last 96 trials. The results of the 28 precognitive runs of 24 trials each were subjected to a linear regression analysis, in blocks of 96, corresponding to the experimental protocol. These data, shown in Figure 2, give a best fit to a line with positive slope 0.56 per run, and a Y intercept at 5.0 hits in the first run. The correlation coefficient was 0.68. This is a clear indication that learning has taken place. ($P<.01$).

In order to verify the functional relationship between accuracy of precognition and time delay, it is necessary to alter the machine so that it makes its target selection some variable time delta-t after the subject makes his selection. The time interval between the subject's choice of target and its occurrence should be randomly varied. A plot would then be made of precognition hits vs. temporal distance in seconds or minutes.

This experiment must be performed using a gifted subject who has already demonstrated significant precognitive ability with this machine. With such a subject, the absence of declining accuracy with increasing time delay would cast great doubt on this model.

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DISCUSSION

MEERLOO: I enjoyed your lecture very much. In my book *Along the Fourth Dimension,* I look at those same questions purely from a psychological angle. But there is a coincidence: I also have the same kind of scheme. However, I want to add something to it. When you ask people to look into the future, there comes anxiety because the future means death, just as the past means birth. These are two hard and fast points. Nevertheless, there is a continual function—and psychology has not given enough attention to it. We are continually changing the past, newly interpreting it. A trauma, now, can change the impact of events of twenty years ago. And, of course, also the other way around. Now, as to the question of dream time, we cannot measure it completely—only special dreams that are parallel to the rapid eye movements. But I can tell you that somebody who nearly drowned and was saved just in time, dreamed all his life and all his dreams were affected by that particular occurrence. A dream has no time, because it is not immediately told to the investigator but only much later, when it becomes infiltrated with the subject's anticipation and past. Of course there are different functions of time. Biological time is one of the functions. The clock is ticking in us continually, even though we are not always aware of it. When we talk about psychology, we have to distinguish still another function of time. Precognition is there, and, obviously, here, too, psychology has not given enough attention to it. Now a question regarding your experiment. You do it only in a lab. I would like you to do it with chess players. They are much more used to looking in the future.

BRIER: In the experiment, you have got this kind of learning curve or increase in precognition. But, what about clairvoyance?

TARG: The clairvoyance part involved a lot of trials before I started taking data. The subject that I reported on had probably made several hundred unrecorded trials, more or less at chance, than during the period of the 1600 trials, to build up her scoring to preset criteria in my protocol. I had said I would not go on to precognition until I had some subjects who were scoring at least 40 hits out of 96 trials. I went through several weeks during which I thought I had set that level much too high. Forty hits out of 96 trials requires an extremely efficient clairvoyant perception. Forty out of 96 is 3 standard deviations per run of 40. But that is where I drew my line, because I consider that precognition is a kind of stepchild and much less likely to occur than clairvoyance. So I wanted at least to make sure that I had clairvoyance before I went on to do something harder.

BRIER: But what about within the 1600 trials, then. Can you still break down the 1600 clairvoyance trials after these preliminary trials? Did you get learning?

TARG: I did not get learning within the 1600 trials, according to the criterion. If I just plot it, I do not get significant learning, even though certain groups of scores got higher, as I was faced with this kind of psi-missing of very large variance. From time to time even my best subject would score at chance, and chance was well below her normal scoring at that point. So, I may get some of these extremely high scores toward the end of the run. I had three days in a row when this subject scored in more than 40 trials and a couple of runs where she scored 14 to 15 hits out of 24 trials. It was a fantastic thing to see. However, on a previous day, some uncontrolled factor of her psi was not functioning and she scored low. So you take all the data together. It is nonsignificant learning, unfortunately. However, if you collect the data in some optimal way, it is clear that her good scores were getting better and better. But that is such an after-the-fact analysis and requires so much conversation, that I would just assume that in any kind of conventional way, learning did not take place.

WEST: I would like to ask a question about the model that you proposed of this premonitory wave, so that you see something and the event comes later and you remember that you have seen it before. What explanation does this theory have for the fact that we do not do this all the time, that it is only occasionally that we get a déjà-vu experience and that this is not our regular method of perception?

TARG: That is, of course, the $64 question. One does not know why all these things are not happening more often. Everyone has a precognitive dream from time to time. If you find that you ever have one, why in fact do you not always have them? Unfortunately, I do not have the answer to that. I think, as a city dweller, my feeling is that through evolutionary time, we have learned to shut down these senses to survive.

MEERLOO: Déjà-vu is not only in the future, it is also in the past. So it works both ways. In psychoanalysis, we usually find the connection with the past, not with the future.

WEST: First of all, I wish to congratulate Dr. Targ on his work because I think he made a very good point in favor of the theory of precognition. Not only in theory, but experimentally. For once, I have understood his machinery. I usually do not understand machines. But, I am a bit puzzled, as are previous speakers, about the déjà-vu explanation. Of course, this is not new, because many times déjà-vu has been considered as a precognitive phenomenon. However, we have at least two or three psychological models of the déjà-vu experience which

make quite a lot of sense. And so I really think, as Dr. Meerloo was saying, that in the psychoanalytic situation, we have the "déjà-raconté" in Freud. Freud wrote a little paper about the "déjà-raconté" analysis. The way we can deal with this phenomenon makes such a good deal of sense that I do not think it is necessary to think of this phenomenon as a precognitive phenomenon. This is my impression as a psychologist.

TARG: If you tell me there is consensus with regard to the explanation of déjà-vu, then I would properly abandon that. It had been my feeling from talking to, perhaps not clinical psychologists, but more experimental psychologists that, although some explanations had been offered—some of them fairly far-fetched, involving perceptual time delays within the organism—although there were some explanations available, that it was, at least to some extent, an open question. If that is not true, then I would not offer further explanation.

CAMSTRA: I would like to come very briefly back to Mr. Orme's point of yesterday. He gave an answer to my question of yesterday that he tried to circumvent the forgetting hypothesis by recording his dreams for a number of years, but unfortunately he did not get around to telling us whether this has resulted in the occurrence of a statistical necessary number of precognitive occurrences and, if so, whether the same decay curve was then again obtained.

ORME: I have not finished this, I am afraid.

CAMSTRA: So that might warn Dr. Targ not to be too glum.

POYNTON: Dr. Meerloo criticized the work on dream time, because some people near death apparently have a presentation of their entire lives in a matter of perhaps even a few seconds. I wonder if it is really the same thing as a dream. Is it not perhaps some almost postcognitive scanning which is not really the same thing as a dream at all? The work on dream time suffers from this criticism. Are we not getting something quite different here?

TARG: I agree with what you said and forgot Dr. Meerloo's first comment, in answering his subsequent question. The work that was done seemed very convincing. They would have a subject who was asleep and dreaming as evidenced by eye movements. They tried to influence his dream by burning him or shocking him or sprinkling water on him. Some time later they woke the person up, saying: "Tell us about your dream, we know you have been dreaming." The person would recite his dream, which, most of the time, had incorporated the stimulus. They would ask the subject how long it was between the time he was awakened and the event which initiated the dream. The time estimate and the length of the narrative the person would give for whatever phantasy or dream he was having, that time duration was, in

fact, a very good approximation of the actual time between the stimulus and the waking.

MEERLOO: I agree with this. But we are talking about a semantic question. We have talked for years about images which, at different times, are felt as being longer or shorter. The analyst only asks a couple of hours later and then the man has filled in other occurrences from his own consciousness. Then the dream seems to last longer. So obviously, our estimate of time depends on the occurrence when we bring out our garbage can of memories.

BELOFF: I have two questions I would like to ask about your theoretical model. First, can you derive from it any kind of limits beyond which precognition should not be possible. And, second, connected with this, have you envisaged any kind of law for the relationship between the magnitude of the perturbation concerned and the extent to which it should affect the interval of precognition. If one takes the most extreme case known to me, the prophecies of Nostradamus, these were made in the mid-sixteenth century and some people claim (and I do not want to discuss the validity of these claims) that there were prophecies there that can be related to events in the twentieth century, notably to the rise of Hitler. Is it conceivable, on your model or in any developments of it, that something so epoch-making and world-shaking as the phenomenon of Hitlerism in the twentieth century could, as it were, throw back waves into the sixteenth century, or would this be completely in the realm of fiction?

TARG: I do not have an answer, but I can make one up. I did not have an answer until you gave me the example. The accuracy of precognition or how it falls off with time, or how far you should look into the future are functions of the sensitivity of the receiver. I have no information at all about what kind of neurological or interpretation processes are involved. The model can give the functional relationship; that is, I claim that there will be some kind of exponential fall-off. Now, I do not know what constant to put in the exponent. A typical problem in physics is that you can make a model and then the goodness of your model is a function of the boundary conditions you put in. I have no way of knowing that. Now what do I say about Nostradamus? I would say, from this model, that Nostradamus would not, in fact, be able to look 400 years into the future. The reason for that is, that if a prediction 400 years in the future was still detectable, then that would imply the prediction one day in the future would be a whole lot better than we find that it is. Is that understandable?

DINGWALL: I have a very simple, and I suppose rather silly, question to ask, quite down to earth, and that is: I do not understand your story

of the clock. You are suggesting that there is a form of precognition in this clock phenomenon. Of course, there are many people who are able to wake up at a certain time. Now, if the clock is set, do I understand that the dreamer wakes up a little before the clock goes off and that that might be considered precognition? Is that what I understood you to say?

TARG: I am saying approximately that. I would add that what you are saying makes it sound like a very simple-minded example, indeed. If you habitually set your clock for seven o'clock in the morning and you wake up ten minutes to seven and say, "Look it is ten to seven!" that would not be a very surprising phenomenon. If you set your clock for seven o'clock and sit up in bed startled and, within seconds, your clock goes off, and that is an occurrence that many share, that is the subjective feeling of having been awakened out of sleep and immediately having the alarm clock go off.

DINGWALL: I could agree with you if I could be assured that the people are accurate in what they say. But you would certainly expect the sleeper to be awakened very slightly before the alarm because of the click which indicates that the mechanism is about to go off. The click depends, of course, on the make of the clock.

KOESTLER: There are two points. The first is in the Shackleton experiments, when the card calling went at a quicker rate, then Shackleton guessed at 2.4 seconds. If the card calling went at a slower rate, he guessed at 1.4 second. Do you see any significance in that? Do you think the significance is somehow connected with having five choices. If it were ten choices, it might be different.

TARG: That presents a possible problem with the theory, that there is an alternate model that the experiment would suggest. It might be that he has his attention fixed at some point in the future, and that is where he was looking, come what may. I think you would have to do experiments to find out whether that was happening or whether he simply could not cope with the rapid rate of card calling.

KOESTLER: Here is the second question. He used a striking word, the "viscosity" of the situation. He used the image of throwing a pebble into a pond, which throws rings into the future and the past. Obviously, if your pond is a cup of tea, then there would be a storm in a teacup, but if it is in porridge, it will hardly make any impact.

TARG: That was exactly the model I was trying to create, the image.

KOESTLER: How do you define viscosity?

TARG: It is a property of our space-time continuum, which governs this phenomena. It is a describable property. The speed of light is

given; we do not say "Why does light travel at that speed?" It is one of the boundary conditions.

KOESTLER: Would you accept the difference between tea and porridge? The degree of viscosity depends on the number of constraints, the number of degrees of freedom in the developing process, the degree of habituation and even ritualization, the number of choices, that kind of parameter.

TARG: Yes. Instead of the number of choices, I would think of the probability of the given event, which is, of course, the same thing. That works out very well, does it not? My model is of the probability of the event humping up to unity, at the origin. Now, if the event becomes more improbable by going to ten choices from five, then at some given distance from the origin, it is going to be less probable for the larger number of choices than it would be for the smaller number of choices.

KOESTLER: That is what I meant by the five choices 2.6 ahead.

TARG: Yes, I think that is well said.

SCHMIDT: Regarding your assumption that you have an exponential decay, I think it is very unpleasant for your theory because if you are pretty sure some people can make predictions one year into the future, then you could not distinguish between one second and the markings they put here. It would be a negligible change, because of this exponential decay.

TARG: It depends where you are on the curve. I understand what you are saying and it worries me also. From looking at Orme's information, that has data out to twenty years, it makes it look very difficult to measure this over short time distances.

SCHMIDT: I certainly agree it is an interesting experiment to try again under those bias conditions.

TARG: Do you have a suggestion as to how to overcome that?

SCHMIDT: Feynman had a very bright idea. He asked, "Why do we restrict ourselves? If we have a flashlight, turn it on and wave it into the future. Why not assume primarily that it goes into the past and future?"

TARG: Feynman was also trying to find a use to advance potential.

SCHMIDT: He would get not an exponential decay, but, I think, an ordinary one of inverse square. I do not want to advocate this.

KOESTLER: Would not the rate of decay again depend on the viscosity?

SCHMIDT: I do not know what viscosity means, here.

TARG: The part of this theory that I am least committed to is whether it is exponential or inverse square. It would not upset me at

all. Because, the theory is just a talking point. It is not a theory, it is a model.

SCHMIDT: I would agree. Any theory, if it gives suggested experience, is fine.

BRIER: In your theory, would you not be interested in retrocognition? Should not retrocognition occur just as frequently as precognition, since the waves go backward and forward symmetrically?

TARG: One always decides what to theorize and what to experiment on based on one's own experience. Since really studying the material on precognition, and reading Jung, the dreams that I have from time to time are precognitive. Probably if I had retrocognitive dreams, I would have to make some other kind of theory. Almost all of us, in psychical research, are independent, unsupported people who are enthusiasts and I am trying to understand the phenomena with which I have some experience.

ALBERTI: I wanted to ask you if it would, perhaps, be advisable to introduce an intensity parameter into your model. For instance, the Nostradamus precognition performance referred to very important historical facts. Yours are a little less important on the level of psychological, affective and emotional relevance.

TARG: I agree with you, my targets are absolutely trivial on a world scheme. That worried me. What I made is a little step, starting with the machine that was shown at the proceedings here. I made a much bigger machine—a standup machine that has 4″ by 5″ targets; it rings bells, it is a big garish machine. And I found that people uniformly do better at clairvoyance on that machine than they do on the small machine, even though they are both run by absolutely the same electronic generator. There is more stimulus to perceive, would be the naive answer.