

MODELS FOR THE EXPLANATION OF EXTRASENSORY PERCEPTION

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Vol. 2. No. 5

PRINTED IN BELGIUM

MODELS FOR THE EXPLANATION OF EXTRASENSORY PERCEPTION†

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One of the difficulties for many scientists in accepting the existence of extrasensory perception (ESP) is that it does not make sense in terms of what we know about the physical universe. We do not have any comprehensive theories, any good models, or any sort of generally accepted explanation of the phenomena. Unfortunately, I cannot fill this vacuum. I have no model or theory that will explain the facts of parapsychology.

I shall be concerned then, with problems, rather than attempt to give answers, and point out where models and theories in this area are needed.

My presentation of models must be rather limited due to space. It will not be possible to cover all the phenomena that have been reported in the laboratory, much less those reported in spontaneous cases, nor can I cover all the problems connected with model making for those phenomena I do talk about. As a final limitation, in talking about some past attempts at model building in this field I cannot be comprehensive, but only mention a few attempts.

To begin, I have to make clear exactly what I mean by a *model* and by a *theory*, as I shall discuss both of these. We all want models and theories to "explain" things: but what exactly does the word "explain" mean in this context? We use the term explain in two senses. One of these is what we might call "horizontal" explanation: it is a matter of drawing comparisons with something familiar, of pointing out that what you are puzzled about is *like* something else that you are already familiar with. For instance, someone may ask for an explanation of the fact that when he carries his transistor radio behind a steel building the station he is

listening to fades out, but if he backs up the reception slowly comes in again. We may "explain" this by saying it is like dropping a stone in a lake. The radio waves are like the ripples that spread out, and a rock sticking up from the surface is like the steel buildings: there will be a small area of calmness behind the rock as it interrupts the ripples, but a little further in back of the rock the ripples join again. It is the same for radio waves and the steel building. This is an analogy to something familiar. It makes us feel more comfortable, it makes us feel we "understand" the behavior of our radio set. Another common example of "horizontal" explanation occurs in teaching people about the flow of electricity, where we compare it to water flowing through a pipe: the electrical voltage is like the pressure behind the water, the electrical amperage is like the quantity of water flowing, and the electrical resistance is like the effect of obstructions in the pipe. What we are basically doing is saying that the unknown is similar to the known (with the implication that you understand the known).

There is another use of the term explanation, however, which I will refer to as "vertical" explanation. This is where you "explain" the unknown by talking about events on a different level than those you want to explain, it is an abstract type of explanation. For example, to give a vertical explanation of the flow of electric current we do not talk about the flow of water in pipes: instead we talk about a thing called

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Received for publication: February 18, 1966.

an electron, about the transfer of electrons from one orbital shell to another across atoms, about electrical force fields on the atomic level, about number of electrons passing through a unit volume in a unit of time as measuring the flow of electric current, and the like. We have gone to a more abstract level, a more *basic* level of explanation.

Now this sort of explanation, vertical explanation, is usually of more general application than drawing an analogy to something familiar, and people generally feel that it is a "truer" or more "basic" sort of explanation. In many instances, however, it may not be a more *useful* sort of explanation. For example, a man might tell me that he is designing a bridge to cross a stream, and tell me about the nuts and bolts, girders and beams, he will build it from. I could say to him, "Oh, come on now. You are being fooled by the surface appearance of things! You know that a *beam* is not a basic concept. You should talk about the molecules of steel in these things, or be even more 'basic' about this and talk of the sub-atomic particles and fields that make up the molecules!" By and large, however, I would prefer to cross a bridge that was built by an engineer who knows how to calculate stresses in those surface manifestations called girders and beams, nuts and bolts! The point is to avoid any idea that a vertical explanation is necessarily "better" in all instances.

In science we use both of these kinds of explanations. This will be clearer if I say a few words about the nature of science. Science is basically a set of rules for collecting data and the kind of inferences you can make from these data. If you want to play the Science Game, the first basic rule is that the data you collect must be *public*, i.e., that any qualified person should be able to repeat the steps you took to make your observation and make the same observation. The second basic rule is that you may make any sort of inferences or draw any sort of conclusions on the basis of these data that you wish, but

if you want to call it a *scientific* theory, your inferences and conclusions must have observable consequences. That is, your theory must say that given conditions A, B, and C, you will observe effect D. If you do not observe D, so much the worse for your theory!

Science, then, is a continuous alternation between observing things (or, if you prefer, finding "facts"), theorizing about the structure of things at some more abstract level, making predictions based on the postulated structure of reality at this more abstract level, and then going out and checking your predictions. The observations may agree with the theory, which is always rewarding. If they disagree, you modify your theory or abandon it. You are always going back and forth between observing things, theorizing from these, and checking the inferences about as yet unmade observations: this is the essence of scientific method.

Now a scientific theory is what I have been calling vertical explanation, a going to a more abstract level than the one on which you make your observations, from which you predict back to your observation level. A model in science, on the other hand, is what I have called a horizontal explanation. I shall make the distinction between them clearer in a moment, but let me first talk about what theories do.

Theories perform several functions in science. They help us organize observations, what I like to call the "filing cabinet function." Instead of memorizing ten thousand separate observations you memorize a theory from which you can predict these observations, which is quite a savings in work. They also predict in what areas to look for "important" data—data of practical or theoretical significance. Because of the continuous alternation between observation and theorizing, their continuous interaction, theories are *always* subject to revision or disproof. No scientific theory is ever final: you must always hold your mind open to

the possibility that some observation will come along that the theory cannot account for (predict) and which calls for rejecting or modifying the theory. This applies even to so-called scientific "laws." A scientific law is simply a theory that no one has produced data contradictory to, a theory that has predicted correctly in untold thousands of instances. Thus the so-called "law of gravity" is simply a theory about the effects of two masses upon each other in the absence of interfering forces. It summarizes millions of observations that unsupported objects fall to the earth. But even this "law" is subject to repeal or modification if inconsistent observations are made.

Now here is the crucial difference between a theory and a model. A model can perform many of the same functions as a theory for us: it can organize data, give us a feeling of "understanding," and predict where "important" observations can be made. Also, models often have something of an advantage over abstract theories in that they amuse us! The little machines that people build to model their understandings are usually much more fun than abstract ideas! But, the crucial difference between a model and a theory is that the theory may *never* predict incorrectly, otherwise we scrap it or have to redo it, but we don't expect a model to *always* be true, to always make correct predictions. For instance, the analogy between flowing electricity and water flowing in pipes is an excellent model for teaching purposes, but its predictions are completely wrong in some instances. In electricity if you put too much current through a wire the wire will get hot, but increasing the flow of water through a pipe will not obviously make it hotter. You don't throw out this model, though, because you realize it is only a model and has limitations, but its advantages for teaching certain aspects of electricity far outweigh these limitations. In short, then, the basic distinction between models and theories is that the latter must *always* predict correctly, otherwise they are

thrown out (or take up the humbler status of models).

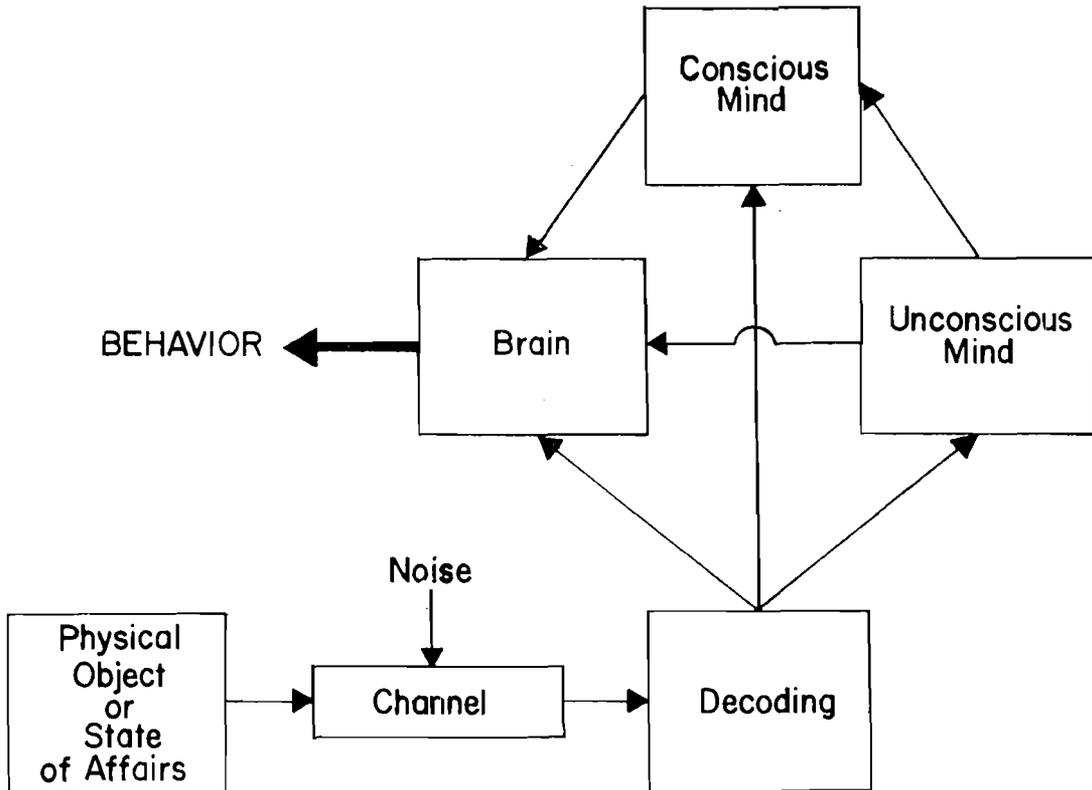
Where do we stand today in parapsychology with respect to models and theories?

I regret to say that we are in a dismal position. By and large, we just do not have any good theories or models. I use the adjective "good" here to mean a theory which organizes a reasonable number of observations *and* makes testable predictions. We do have some theories in parapsychology, but they are too general, too "cosmological" in scope. They are concerned with whether the world is a mental and physical duality or only physical, whether ESP is physical or nonphysical, spiritual or material, etc. These are all very noble problems but they do not lead to any predictions whereby you could make a choice between alternative theories. They are philosophical positions rather than scientific theories. We need theories in parapsychology that are considerably less grand in scope, but are testable.

What I will spend the rest of my time on, then, is a survey of what badly needs to be theorized about and modeled in parapsychology. I will present some general models in the course of doing this, but note that these are models of the current state of our ignorance, rather than models of how things actually happen.

Let us begin with the phenomenon called clairvoyance. The basic observation to which the name clairvoyance is attached is that human beings sometimes exhibit overt behavior from which we infer a knowledge on their part of events or conditions of objects in the real world, when you can rule out any currently known form of physical energy transfer or logical inference that would account for this knowledge. I have sketched a "model" of clairvoyance in Figure 1. The rectangular blocks in this figure and subsequent figures indicate "processes" or "mechanisms" of some sort where information is transformed or utilized. The

Model I: CLAIRVOYANCE



arrows indicate the direction of information flow within the model.

Glancing at the model as a whole, we begin with a physical event or state of affairs from which information reaches the subject via a channel of transmission. After reaching the subject the information is decoded, that is, put in a form in which it may act on the brain and/or the unconscious mind and/or the conscious mind of the subject, and eventuates in some sort of observable behavior from which we infer that the information about the object or state of affairs reached the subject in the first place. Now let us look at these various steps and processes in some detail.

We may begin with the physical object

or state of affairs, the "target" about which we wish to acquire information. Any object has a certain set of physical properties which constitute its nature, its uniqueness. The ruler on my desk, for instance, has a set of physical properties, such as mass, elasticity, the ability to reflect certain wavelengths of light (color), etc., which make it a particular ruler. In addition to these physical properties, we should also allow for the possibility that an object may possess "psychical" properties, properties which would be very convenient in understanding some of the more curious parapsychological phenomena. For example, J. G. Pratt has talked about the "focusing effect" on certain target cards in the research he and Dr. Ryzl have done. Physically these

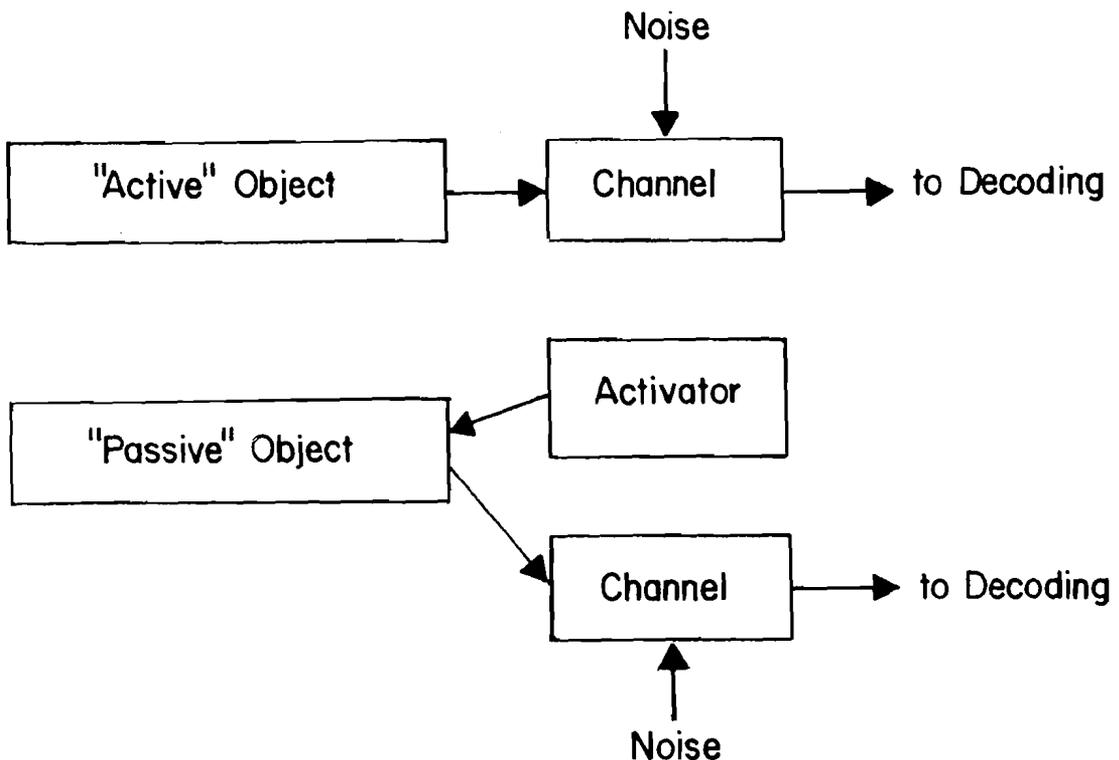
target cards were identical objects (unless you go to an extremely fine level of measurement, beyond that of the unaided senses), green and white pieces of cardboard, yet there were significantly higher levels of ESP scoring associated with some of these target cards than others. So we may postulate that these particular cards have psychical properties of some sort which make them more distinctive to the clairvoyant process.

Another distinction I want to make is between active properties and passive properties, a distinction which applies to both physical and postulated psychical properties. By an *active* property I mean something which is emitting some sort of information by its intrinsic nature or state of being. My desk lamp has an active property, that of emitting light rays. My ruler, on the other

hand, is a passive object in this respect: if there were no light impinging on it from the outside that it reflected back, I would not be able to see it.

In Figure 2 I have sketched the different classes of object in clairvoyance tests. The object may have active properties, either physical or psychical properties, which are simply picked up or detected because they are constantly being "radiated" from the object or event. (I use "radiated" in the broadest sense here, without meaning to imply electromagnetic radiation.) On the other hand, the object might have only passive properties as far as the clairvoyance process is concerned, and only be clairvoyantly detectable because some sort of activating "energy" is impinging on it and being "reflected". This "energy" might be

THE TARGET OBJECT



something that specifically results from a process within the subject, analogous to the way a radar set sends out a scanning beam of electromagnetic energy, or it might be a general background activating energy that does not specifically depend on human subjects for its origin, analogous to the way most objects are visible during the day because of the background radiation of the sun, daylight. Now this first step in the clairvoyance process is where we need some models and theories, and very much need the assistance of physicists in constructing them. There are a number of basic questions here that must be answered before we can begin to theorize, all concerned with the nature of the information that is detected in the process of clairvoyance. What properties of an object or event are psychically detectable? We do not know whether *every* known physical property of an object is detectable by clairvoyance: it might be, for instance, that clairvoyance can detect surface patterns on an object but not be able to tell us anything about its internal molecular structure. We need to know what sorts of psychical properties there are, whether they interact with physical properties, whether there are passive psychical properties that can be activated by some form of external "energy," whether they can be deactivated by some method. Is there any kind of process which might destroy the clairvoyant detectability of an object? We have so many unanswered questions here that useful theorizing is virtually impossible now. As I warned you, though, I am only going to point out where the basic problems are, since I cannot give any answers!

On a more positive note, though, let me give you an example of a small-scale, but testable, theory in parapsychology concerning the nature of psychically detectable objects. This is a theory originated by W. G. Roll of the Psychical Research Foundation and which I was able to help put in final form. The theory postulates that physical objects have some sort of psychical proper-

ties associated with them by virtue of their history, by virtue of what they have been in spatial proximity to, and, of course, that these psychical properties are psychically detectable (albeit quite imperfectly at present) by human subjects. This leads to a testable prediction. If you systematically vary the associational history of an object you should make it more or less psychically detectable in proportion to the differences in its history. That is, if I have one object that has been carried for years in the pocket of a very colorful person, a real adventurer, and another physically identical object that has simply sat in a drawer for the same length of time, a psychically gifted person should have a higher degree of success discriminating these objects by some form of clairvoyance than he would have in clairvoyantly discriminating two identical physical objects that have both sat in the same drawer for their whole history. While we have not begun to adequately test this theory yet, it does fit accounts of spontaneous "psychometry" or object reading, and it illustrates a small-scale but objectively testable theory.

We now have some information available for the clairvoyance process to detect. Because the object or state of events is in a different spatial locale from the subject, we must postulate some sort of channel over which the information travels to the subject. This is no known physical channel, because we rule that out by the definition of ESP. We have no idea what the nature of this channel is. There is a "cosmological" level theory here that say the concepts of "space" and "time" are illusory productions of our own minds rather than conditions in the real world: if you accept this you need ask no questions about the nature of the channel, as there is nothing for a channel to bridge. Until someone tells us how to translate this idea into testable predictions, though, we cannot consider it a scientific theory, so we shall stick with the idea of a channel.

All channels have two important proper-

ties, that of noise and loss: information conveyed over a channel is subject to distortion by noise, and attenuation of the energy conveying the information. We may consider attenuation a form of noise in this discussion. In some particular channels the noise is negligible compared to the amount of information transferred and we can ignore it, while other sorts of channels may be very noisy. Noise may vary from time-to-time in a channel, but as long as the ratio of information energy signal to noise energy is high, the channel is useful for transmitting information.

Given that we need a channel for the clairvoyant information, a number of basic questions arise as a prelude to parapsychological theorizing here. What is the nature of the channel? Does it, for instance, depend simply on space existing between object and subject, or do you need a known physical medium between object and subject? For all we know, clairvoyance might be impossible if there is no air between subject and object, but be much more reliable if there is water between subject and object. Can you interfere with information flow over the channel, and distinguish such an effect from interference at the source of the information or at later stages in the process? Is there any kind of shielding that will affect it? The only sort of shielding that has been worked with to any extent is sheer spatial distance, which does not seem to have much effect (although *psychological* distance seems to). Work being done by Dr. Karlis Osis at the American Society for Psychological Research in New York may indicate a distance effect, but at the moment we really know almost nothing about the effects of distance on clairvoyance. We know nothing about possible noise in the channel, even whether there is appreciable noise: it might be, for instance, that if there are a number of people in the vicinity of the subject that they create a "mental noise" on the channel which interferes with information flow. Can we increase or reduce the channel noise? We do

not know. Again, modeling and theorizing are difficult here for sheer lack of basic data. Also, in investigating particular stages in the clairvoyance process, such as the channel, it may be difficult experimentally to differentiate where the procedure you apply has its effect in the process. For example, you may find scores in clairvoyance tests decline with distance, but this may be due to the beliefs of the subjects (*or* the experimenter) rather than having anything to do with the nature of the channel.

We now have information originating at an object or event and flowing through a channel. Now it goes into a block in Figure 1 I have labelled *decoding*. We can be rather sure that the information impinging on the subject is not in a suitable form for directly affecting him: it does not consist of known physical energies nor of neural impulses that could stimulate the nervous system, so we must have a process to transform or decode the information from whatever unknown form it is in to an adequate stimulus for affecting the subject. It must be put into the proper form for being handled in the internal information processing circuits of the human subject. Now we can think of the outcome of this decoding process as series of neural impulses or, if you are more mentalistically inclined, as mental images or thoughts or feelings: as both points of view can lead to testable propositions I feel no need to join one side or the other of the mind-body controversy, or speculate about which is more "basic."

To make this discussion more concrete, let me point out that you are using a decoding mechanism right now: it is called the eye, and it enables you to see this page. It takes light rays, which in themselves are not suitable for stimulating the nervous system, and turns them into (decodes into) sequences of neural impulses which in turn are somewhere turned (decoded) into your mental experience of seeing the page.

What sorts of questions must we ask at this point before we can theorize? What is

the nature of the decoding process? Does it have a specific locus, or is it a function of the whole central nervous system? The answers to these questions require help from psychologists and biologists, as well as physicists. Our known senses have specific receptors organs (decoders): is there a specific "organ" for detecting clairvoyant information? As another way of asking the question, is there a specific mental structure for decoding?

Another fact about decoding processes or mechanisms should be noted: a decoder not only transforms information from a non-useful to a useful form, it has a limited capacity for decoding information. Your eyes, for instance, with which you see this page decode light rays into useful, neural impulses, but they are also limiting organs: you cannot see infrared light or the ultraviolet. Thus decoders limit information and give it particular characteristics. The sensation of "red" is a particular quality made possible by the operation of a decoding mechanism, your eye, but this decoder also makes it impossible for you to experience the sensation we might call "ultra-red," which would arise from "seeing" infrared radiation.

From this point on we are inside the human subject, and now have several possible routes of information flow. In actual cases they probably all operate to various degrees, but we shall look at each one separately.

The first possible route is where information flows directly from the *decoder* to the *brain* and eventuates in overt *behavior*. As an everyday example of this route, if someone behind you suddenly fired a pistol you would jump out of your chair, and we could talk about the decoding of the intense sound waves into a barrage of neural impulses in the ear and their direct effect on various startle mechanisms within the brain resulting in your behavior of jumping from your chair.

Modeling this particular route of information flow has two advantages in parapsycho-

logy. The first is that it is a purely behavioristic or physiological approach, and so can be a way of approaching the problem for those who do not like the mentalistic concepts of consciousness and the like. More important, however, is that we have observations in some spontaneous cases that suggest that this was the route taken by the extrasensory information, i.e., the subject's behavior suggests ESP of some sort but the subject reports no conscious experience of any sort accompanying this behavior. An analogous laboratory observation occurred in an experiment I carried out a few years ago, in which a subject was sitting in a sound-proof chamber (normally used for sensory deprivation work) while his physiological reactions (brain waves, skin resistance, and heart rate) were being continuously recorded. Down the hall, in another soundproof chamber, an agent (sender) was electrically shocked at random intervals, and I analyzed the subjects' physiological reactions during the times the agent was being shocked. The subjects showed significantly greater reactions indicative of activation while the agent was being shocked, compared to control periods, yet their conscious guesses of when they thought something was happening bore no relation to the shock periods. Thus we have a form of behavior, internal activation of the central nervous system, suggesting the operation of ESP, but with no indication of conscious mental participation, a flow of ESP information directly from decoding mechanism to brain.

Given the possibility of this route, there are many questions to answer before we can adequately model it. What is the neural pathway from the decoding mechanism to the eventual behavior? This, of course, is a very general question for psychophysiology, but we can make the question more specific: is this the same neural pathway as is used in non-paranormal processes? What sorts of general brain conditions can affect this decoder-to-behavior pathway? For example, is

a high level of activation favorable to information flow along this route, or a state of relaxation? In being "behavioristic" in your approach, you may focus on the behavior of the subject, letting the exact workings of the brain leading to that behavior in the hands of others.

Let me point out an example of a behavioristic approach to modeling here, similar work done independently by Christopher Scott in England and Remi Cadoret in Canada. They postulate four ways in which ESP can occur. In the first you have continuous transmission of ESP information and this information consists of all relevant facts about the target material. In the second case the transmission is continuous, but the information itself is not comprehensive, i.e., all the information you want is not being encoded into the transmission. In the third case the information transmission is discontinuous, but when it does occur all the relevant aspects of the target are transmitted. In the final case the information flow is discontinuous and incomplete. Both investigators have proposed statistical techniques for distinguishing which of these models is correct, and while they have not been tested yet, they do illustrate a purely behavioral approach to explaining ESP which may be fruitful.

Now let us examine another possible route of information flow, from *decoder* to *conscious mind* to *brain* to *behavior*. I will emphasize questions about the decoder to consciousness link here, as the consciousness to brain to behavior link is a general psychological problem. The observation that requires postulating this route is that in many spontaneous cases of ESP the subject has a conscious experience which contains the ESP information, such as a vision or feeling, that he then tells about (the overt behavior). We can ask questions about the nature of the linkage between the decoding process and consciousness. We can ask what sorts of conscious mental attitudes and characteristics affect the flow of ESP information.

Dr. Schmeidler's work on the effects of belief and disbelief on ESP performance deals with this question, as does Rhea White's recent review of various conscious activities engaged in by high-scoring subjects in the past. What sorts of conscious acts can aid information flow from decoder to consciousness? Mental relaxation? An attitude of expectancy? Free play of imagery? Occult exercises? If there is an activating mechanism within the subject needed to pick up information by clairvoyance from passive objects, what sorts of conscious acts make this mechanism or process function? We have no lack of questions to answer before we can theorize about this route!

A third possible route that can be modeled is from *decoder* to *unconscious mind* to *brain* to *behavior*. By unconscious mind, I refer to the conventional concept of a dynamic area of the mind which significantly influences our behavior and feelings but which is generally inaccessible to conscious inspection. Call it a Freudian or Jungian unconscious if you will. The basic observation which requires us to postulate such a route consists of cases where a subject's behavior suggests that ESP is operating, that this behavior seems to be affected by unconscious drives or affects, and there is no conscious representation of the behavior sequence. To make this more concrete, consider a subject who has been hypnotized and told that he will not hear the experimenter's voice after awakening, but that whenever the experimenter says some key word the subject will twitch his hand. After awakening the experimenter says the key word. The subject's hand twitches, yet on questioning he swears he did not know his hand twitched and did not hear the experimenter say anything. We also observe that the hand twitch took the form of a thumbs down gesture, congruent with an unconscious resentment by the subject over being manipulated in this manner.

With the parapsychological area, the phenomena of psi-missing suggests such an information route. Psi-missing refers to the

observation that some subjects score significantly *lower* than chance expectancy. This could only occur if they were utilizing ESP on an unconscious level: you can not give an excess of wrong answers unless you "know" what the right ones are. The information is thus received on an unconscious level and processed, in accordance with conscious and/or unconscious attitudes, to come out as a wrong answer.

All sorts of questions arise over the functioning of this information flow route. How does the unconscious affect behavior in general, as well as with particular respect to ESP information? Is there enough regularity in the way ESP information is transformed and distorted that we might learn to "decode" or translate the final output and get back to the original message?

There has been one attempt at theorizing about this route. I refer to Carl Jung's theory of Synchronicity, which postulates an essential connection between potent archetypal constellations in the unconscious mind and ESP events, but, by and large, Jung's theorizing has not yet been developed to the point of being able to make *a priori* predictions on this basis.

The fourth possible information flow route is from *decoder* to *unconscious mind* to *conscious mind* to *brain* to *behavior*. The basic observation here is that many conscious representations that contain ESP information also show signs that the information has been distorted in ways which are congruent with what we know of unconscious dynamics. Dreams which convey ESP information are an excellent example of this. Some dreams that subjects report are straightforward pictures of a situation apparently perceived by ESP, while others are a symbolic representation that the subject "translates," thereby obtaining the information. For example, a woman I knew had several times dreamed of the death of relatives, but she never dreamed of this directly: rather she would dream of taking a train trip while dressed in black, and

through experience had learned to interpret this as indicating that a relative had recently died.

Numerous questions arise about this information route. There is the general psychological question of how information passes from the unconscious mind to the conscious mind. There is the more specific question of how this happens with ESP information and whether this differs from other kinds of information. What sorts of conditions in the conscious mind facilitate the flow of information from the unconscious? What sorts of conscious conditions minimize the distortion that seems to occur as information passes from one level to another? Etc., etc., etc.!

We have looked at four discrete pathways that information might flow through after reaching the subject's decoding process. In the typical spontaneous case of ESP, probably several of these pathways are simultaneously active, thus complicating our task of understanding what happens.

Let me point out several other features of this model before we leave it and move on to the next. I have introduced this as a model of clairvoyance, but in many ways it is far more general than that. For instance, it is a model of ordinary visual perception. My ruler is a passive object that emits information by virtue of the background radiation of light in the room. The channel of space between us conveys the information in the form of light waves to a specific decoding mechanism, my eye. The neural impulses from the eye somewhere eventuate in the conscious experience of seeing a very specific thing, a *ruler*.

This model can also be a model of precognition, if you "simply" allow the channel the property of extending through time as well as space. It can be a model of telepathy if you think of telepathy as being the clairvoyant perception of the state of someone else's brain.

I have gone over this model in considerable detail because the other models

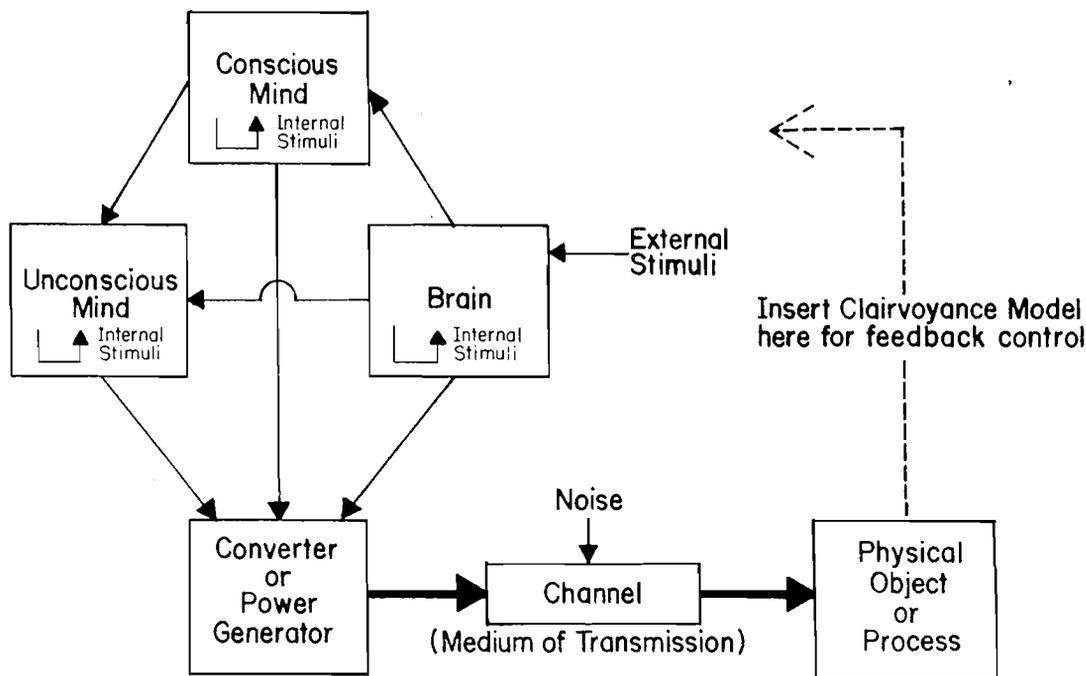
have many features in common with this one.

Let us now turn our attention to the phenomenon of psychokinesis or PK, which is appropriate to discuss at this point as, in many ways, the model for it is the reverse of the clairvoyance model. The basic observation here is that subjects seem to be able to significantly influence the outcome of physical events by paranormal means, simply wishing that they happen in such and such a way. The typical PK experiment involves throwing dice by hand or machine and willing that selected target faces come up more frequently than would be expected by chance. The evidence that there is really an effect here is nowhere nearly as strong as the overwhelming evidence for the existence of clairvoyance and telepathy, but the laboratory evidence, in conjunction with occasional spontaneous cases, is still quite convincing.

I have "modeled" our problems in this area in Figure 3. Note here that we start with an external stimulus or item of information, viz. the experimenter's request to the subject to make a particular die face come up as frequently as possible. This information, the flow of which is again represented by arrows, is processed internally by brain, conscious mind, and unconscious mind, and ends up in a process I have called the converter or power generator. From this point on I have used heavy arrows to indicate that some sort of "power" flows over a channel and finally affects a physical object or process. We shall now consider this model in detail.

Within the subject, that is, between the initiating information and the output of the power generator, we can conceive of four possible routes of information flow, as well as the possibility of simultaneous operation

Model II: PSYCHOKINESIS



and interaction among the routes, just as we did for the clairvoyance model in getting information from the decoder to overt behavior. Starting with the external stimulus in every case, the first route is directly from *brain to power generator*: this is a behavioristic or physiological approach. I do not know of any observations offhand that suggest this route may function, but if we can devise experiments in PK using animals we might have something here, or if we someday found that direct electrical stimulation of some brain area produced psychokinetic effects we would have evidence for such a route operating in isolation.

The second possible route of information flow is from *brain to conscious mind to power generator*. This is what ostensibly happens in everyday PK experiments: the subject is consciously aware that the experimenter has requested that he exercise PK, and he consciously tries to operate whatever mechanism does the job. Obviously this mechanism is mysterious indeed, in that no subject has ever been able to say that whenever he does conscious operation X he invariably gets a PK effect. Thus *something* intervenes between the conscious desire to produce a PK effect and the effect, although this may not be necessarily so in all conceivable instances, and we can conceptualize a direct effect of conscious mind on the power generator.

The third route takes into account the mysterious *something* that intervenes, for the route is *brain to conscious mind to unconscious mind to power generator*. The fourth possible route is from *brain to unconscious mind to power generator*, with no conscious involvement. This final route is again largely a theoretical possibility, and I cannot produce a clearcut example to illustrate it.

All the questions that we raised about the interaction among these possible routes for the clairvoyance model apply here. I shall not detail them again but simply remind you of the vast number of fundamental questions

that stand in the way of adequate theorizing and modeling.

Just to complicate things a little more, or, more accurately, to reflect the complexity that undoubtedly exists in reality, I have drawn in an arrow within each process area of the organism (conscious mind, unconscious mind, brain) labeled "internal stimuli," to reflect the fact that there are more events than the experimenter's request to influence the dice operating in the information processing. For example, there may be some spontaneous discharge or "noise" within the brain that interferes with information flow to the power generator. Or you may consciously dislike the experimenter, so that while he tells you to make the dices come up fours, you mentally say "Nuts to you", even while trying to do so because of the obligation imposed on you by virtue of participating in the experiment. Or you may be consciously cooperative, but on an unconscious level the experimenter reminds you of someone you dislike, and the unconscious mind alters or interferes with the flow of information designed to set the power generator into action. You can imagine a complex situation with all sorts of these factors working such that you score terribly on the dice, but the machine that throws the dice mysteriously breaks down! Thus you may have complied with the request to exercise PK (the machine breaking) while also expressing your hostility toward the experimenter, but not being consciously aware that you are anything but a cooperative experimental subject.

Most of our experimental problems at this stage are ones for psychologists and neurophysiologists, matters of how to activate the power generator, given the complex nature of human beings.

Now let us turn our attention to this mysterious process I have been calling the power generator. We need to hypothesize some sort of process or mechanism here simply because the known electromagnetic or chemical energies of the brain cannot

influence external events of any magnitude if they do not do it via muscular intervention. The electrical field of your brain is the only thing that really gets through the skull at all, and it is just too impossibly weak to influence the course of a falling die ten feet away, even if it could somehow be focused. Thus we need a power generator, a process of converting the informational command to influence that die into some form of power that is capable of influencing that die.

I use the word "power" here in the broadest sense of the word to simply designate something that can do work, that can change the state of things or processes. I do not refer to any known form of energy, and I do not feel it is fruitful to argue whether this is a "physical" or "non-physical" form of power, whether it is "spiritual" or "material": the question is what is the nature of this power, how does it operate, what things affect its operation?

To concretize all this, let me point out that I am using a power generator right now: the nerve impulses conveying the information I want to get across to you are activating a particular form of power generator called a muscle, in fact, a whole set of muscles, which enable me to write this page and eventually, to bridge the space between us and activate your decoder mechanism, your eye, again producing neural impulses in your nervous system, which somewhere end up as the conscious registration and understanding of what I am writing. This is an example of a normal process which, if you think about it, is actually fantastically complex and not understood in many of its most important aspects, but since it is so familiar, who ever thinks of it as a mystery?

Going back to our power generator, we have many fundamental questions to answer about its nature. Is there a special brain center for it? Is it some form of "mental" energy (whatever mental energy is in the first place)? Does it consist of specific

electrical or chemical operations? And what is the nature of the power generated by it? Are there known forms of physical energy generated in conjunction with or as an aspect of the PK power?

With regard to the latter question, there must be a yes answer in some form. No matter how unknown the basic form of PK energy is, at its point of application it affects physical objects, and so must have some sort of physical energy component.

We are totally ignorant of the nature of the PK force, much less the nature of the generator, and obviously our theorizing and modeling here is negligible. To illustrate how we might develop some fruitful theories, though, let me indicate the substance of some discussions I have had with Mr. Edward Cox of the Parapsychology Laboratory at Duke University over the past couple of years. He has invented some new types of machines for testing PK. These machines involve the subjects attempting to influence a very large number of moving particles, such as drops of falling water, ions moving through a solution between two electrodes, etc., and he has been getting some good results, in terms of statistical significance, from these devices. I felt that his devices offered a chance to test two alternative formulations of the nature of the psychokinetic force. One formulation would be that PK is a spatially discrete "push" or "jab." The other is that PK is uniformly spread out over a fairly wide volume of space rather than spatially discrete. If the former theory is correct, we would expect maximum success in PK tests involving single objects. If the latter, many objects moving through this wider field would utilize the PK force more effectively and thus give greater success. Let me emphasize though that this is not a formal theory as yet, but an illustration of how a small-scale theory might be developed *and* tested.

Now let us consider the nature of the channel, by which I mean the medium

through with the power is transmitted from the point of generation to the point of application. As a normal example, if I lift my ruler, the molecules of the skin of my hand serve as the channel or medium of transmission whereby the power from my muscles is applied to the ruler. Some energies, such as radio waves or light, require only space as a channel, others require a physical medium, as, e.g., sound waves require air to travel.

Note another feature of a channel, which I have labeled noise to maintain comparability with the clairvoyance model. You could think of this noise as loss, distortion, or "slippage". In shooting an arrow at a target, e.g., any wind blowing across the range constitutes noise, for it deflects the power in the arrow from being applied at the point you intended.

Given these characteristics of the channel, we may ask many questions about the nature of the channel in PK. Is it just space, or must there exist a physical medium between subject and PK target? Can PK operate through a vacuum, or under water? Is any kind of shielding possible? Is there any loss of PK force with distance? Can PK operate forward and/or backward in time, or only in the present? Does the nature of the channel limit the amount of PK force that can be transmitted through it? Note that we are now asking questions that we must have the assistance of physicists (paraphysicists?) to answer.

At last we arrive at the object to be affected, usually a die spinning through the air. We can immediately ask what physical (or psychical) properties an object must possess in order to be affected by PK. We have long worked with an implicit assumption that almost any convenient object will do for PK tests, but, aside from some early exploratory work on dice size, there has been no systematic exploration of the effects of various properties of objects on PK effects. Perhaps metals, e.g., cannot be affected by PK, while ceramics can, etc.

Then there is the question of whether or not these properties can be altered by physical manipulations. And, if objects may have psychical properties, as we postulated in the clairvoyance model, perhaps they have psychical properties that allow PK to operate on them: it sounds like we will be right in the midst of magical and occult rituals next, where the charmed dagger could be controlled by the magician at a distance! If the data turn out to call for these properties in order to be understandable, however, we should not avoid them because they have become unfashionable in the modern world. If a magician comes into my office and says that if he performs his particular ritual then X will happen, we can be perfectly scientific in observing whether or not X does happen given the ritual, even if we prefer another explanation (a theory that appeals to us more) of *why* the events were related.

Let me add a final complication to this PK model, which I have drawn in as a dotted line from the object back to the human subject. If you think about it, how can you possibly influence a falling, tumbling, spinning die to land with a given face up just by exerting a momentary or continuous push on it? Obviously you have to know exactly where the die is and all the components of its velocity, linear and angular, at the moment you are ready to "push" so that you can push with just the right amount of force in just the right direction. Thus for the case of falling dice we have to insert the whole clairvoyance model as a form of informational feedback between dice and subject in order to make it a workable system! I will not even attempt to point out the way that this multiplies the possible interactions within the subject, but is it any wonder that the results of PK tests have generally been slight?

In the course of leaving the PK model, let me note two other things. We can use this model as a model of normal action, if you think of muscles as the power generator. You can also think of this as a model of

telepathy if you conceive of telepathy as psychokinetic action on someone else's brain!

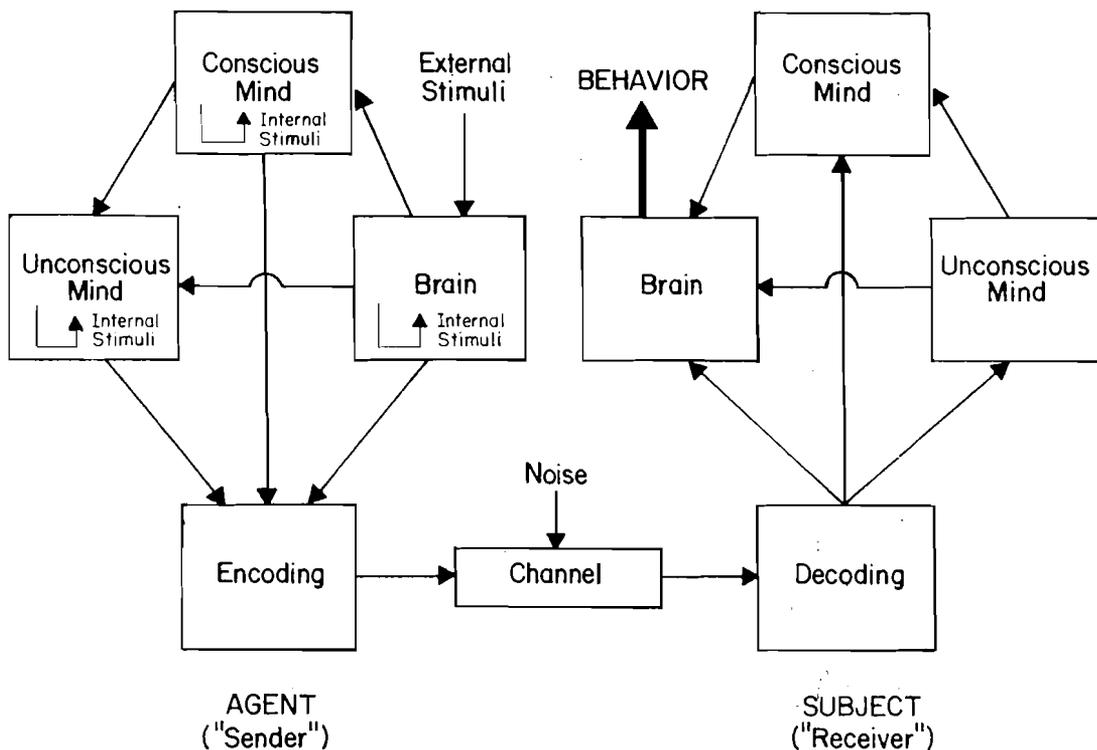
Let us now briefly consider the third model I want to present, a model of telepathy. This is sketched in Figure 4. You will notice immediately that it is a combination of the clairvoyance and PK models. All the previously mentioned considerations about getting information to activate the power generator in the PK model apply here to the problem of getting the information to be transmitted into the encoding mechanism, the mechanism or process whereby neural or mental information is turned into a form suitable for telepathic transmission. Then all the problems that arise between decoding and the final overt behavior occur in the person acting as receiver, as

occurred in the clairvoyance model. Then too, while the diagrams here look the same, this does not necessarily imply that the identical mechanisms or processes are used as in the PK or clairvoyance processes, only that similar functions must be performed.

Let me bring things together now by discussing the most popular "theory" of telepathy, and showing you why it is a model and not a theory. I refer to the idea that telepathy is a form of mental *radio*. I will sketch this conception from my point of view as a "ham" radio operator and ignore psychological considerations.

Basically, the theory of mental radio postulates that the encoding mechanism is an electrical network in the brain which functions like a vacuum tube radio trans-

Model III: TELEPATHY



mitter, feeding the human body as an antenna, just as commercial radio stations broadcast. The channel of transmission is then ordinary space. The decoder is an electrical network in the brain which functions like a vacuum tube receiver, again using the subject's body as an antenna. This conception "explains" or makes us feel comfortable with all sorts of observations about telepathy—it forms analogies with them. Here are some of these things:

Warmup:

Observation: subjects have to get in the mood, "warm up" sometimes before they can do well in telepathy tests. "Explanation": the tubes in both transmitters and receivers have to heat up and circuits stabilize before they function well.

Selective Transmission:

Observation: some pairs of subjects are good in telepathy experiments, others are not. "Explanation": only transmitters and receivers that happened to be tuned to the same frequency will transmit information.

Incomplete Transmission:

Observation: only parts of the target material are sometimes received. "Explanation": radio transmissions are subject to atmospheric static and attenuation that washes out part of the message.:

Agent Differences:

Observation: some subjects are much more successful as agents (senders) in telepathy experiments than others. "Explanation": some transmitters are more powerful than others and can send on more frequencies.

Subject Differences:

Observation: some people are better subjects (receivers) than others. "Explanation": some receivers are more sensitive and cover wider frequency ranges than others.

Training for Telepathic Ability:

Observation: some subjects seem to be able to sort out telepathic messages from the background noise of their own minds

better than others, and improve with practice. "Explanation": some radio operators learn to listen through the noise on radio sets and receive much more of a message than others. Further, some receivers have special circuits built in that reduce noise.

The mental radio position also performs the functions of a scientific theory in suggesting where we might look for observations that are important. For instance, we might see if a higher antenna helps (raising the subject high above the earth), if some people act as directional antennas (they do well on telepathy tests if the other person is in a particular direction from them), whether a good ground connection helps (connect the subject to earth), and whether reducing the noise from nearby sources improves reception (get your subject away from the mental noise generated by nearby people).

The mental radio position, then, is a good model. It makes the unfamiliar facts about telepathy analogous with the familiar ones about radio, and even suggests other things to look for. It fails as a scientific theory, however. As I stated earlier, a scientific theory must *always* make correct predictions, and the mental radio position fails miserably on three important predictions. First, it would predict a square-law falling off of telepathic effect with distance, which has not been observed. Second, it would predict that electromagnetic shielding of either agent (sender) or subject (receiver) should reduce or eliminate telepathic effects, but this has never been observed—indeed, there is some suggestion that shielding enhances the effect! Third, and finally, the known radiation of electromagnetic energy from the human body (primarily the brain waves or electroencephalogram) is so weak with respect to the ambient noise level that exists on earth that it would be wellnigh impossible to conceive of an electronic instrument that could detect this radiation even a few inches from the head, much less at a distance of miles. Thus the idea of mental

radio is a good and intriguing model, but indefensible as a scientific theory.

To summarize, then, I have talked about the nature of models and theories, pointed out where we have the most pressing need for and greatest difficulty in constructing models and theories with respect to the basic parapsychological phenomena of clairvoyance, PK, and telepathy, and briefly mentioned some of the models and theories that have been proposed in this area.

What are our prospects here? As I mentioned at the beginning many scientists have difficulties in accepting ESP because the phenomena make no sense in terms of current theories about the nature of the world. For many people who Carl Jung called the introverted intellectual type (which covers many scientists), having a comprehensive view of things, an all inclusive theory, is vitally important, and if the facts do not fit the theory, so much the worse for the facts! Thus we badly need some theories in this area for that reason. A further need is for theories and models to organize the data of parapsychology: there are so many scattered observations and literature that the investigator can not hope to digest it all, and we badly need some theories to organize all this material.

Yet how can we hope to construct adequate theories and models if the data we work with are so unreliable? How can you

theorize, e.g., about the nature of the energy involved in PK when you do not know if there is a distance effect, whether it can be shielded, etc.? How can you test the manner in which various factors affect telepathy and clairvoyance if you are dealing with such a small scale and unreliable effect that you have to put in tremendous amounts of experimental time to check out even one factor? On the other hand, how can you train subjects to produce the phenomena at a higher rate, making its study easier, when you do not have models or theories to guide you in this endeavor? We are caught in a vicious circle of not having enough ideas of how it works to make it work so we can get some idea of how it works, etc., etc., etc., around and around!

I do not like to end on a pessimistic note, especially after spending my time "modeling" ignorance, but we are in a bad position. What we need in parapsychology are small-scale theories, testable theories. We are not ready to tackle the big questions of spiritual versus material and the like. The total amount of research in parapsychology is negligible compared to almost any other field of science, so this situation is not surprising. But if we have the opportunity to expand our research efforts, we can at least take the more optimistic position that in view of our tremendous ignorance we have the opportunity to make really significant and revolutionary discoveries.