an increasing number of such high-scoring subjects much of the prejudice of ordinary scientific workers will disappear. When more and more competent Experimenters report on cases of high-scoring subjects, the hypothesis of collusion will become as extinct as the dodo. While it is, in the last resort, possible to suggest that two or three Experimenters have faked their results, this will not be possible when scores of competent investigators produce their reports on similar cases. I suggest to Price, therefore, that efforts should be directed toward the discovery of the personality characteristics of these people who make averages of 8 or 10 hits per 25 over considerable periods, the sort of communities in which they may be successfully found, and so on. In other words we should aim at repeatability by more and more investigators.

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Comments on "Science and the Supernatural"

J. B. Rhine

Credit Side

Strange though it may seem, the publication of the George Price paper, "Science and the supernatural," is, on the whole, a good event for parapsychology. It is not merely that it is better to be attacked than it is to be ignored. According to the ways of American science, a revolutionary finding has to be cuffed and kicked through the entrance in order to gain admittance. When unorthodox issues are concerned, only critical articles, and the rougher the better, are likely to be accepted by the scientific periodicals. In fact, one can easily fancy (as some readers have) that Price deliberately undertook to sell parapsychology to American science by disguising a really informative article as a slanderous critique, with charges so utterly exaggerated that they would not be believed even by skeptics of ESP. At any rate, as a way to get a lot of instruction on parapsychology into *Science*, it worked as well as if it had been planted.

It is also of value to parapsychology to have Price portray so vividly the potential importance of psi abilities. He has even more clearly appreciated the great potential applications of ESP than have many of the workers in the field. It is true that he has overlooked the limitation owing to the unconscious level on which this elusive function operates; but if (as is not unreasonable to expect) that limitation can be overcome through future investigation, his picture of the utility of psi will be entirely realistic.

Again, credit goes to Price for his coverage of the older criticisms of the psi research. Although they have been answered many times in the literature of parapsychology by others, Price has summed up the case rather well—so well, in fact, that but for the philosophical blockage from which he reveals he suffers, he sees nothing to prevent the acceptance of ESP. It is true that, rather than to question the mechanistic philosophy that he recognizes is at issue, he oddly professes to believe that all parapsychologists are liars and montebanks; but such a wild charge, even if Price really intended it to apply to the dozens of university and other scientists involved, is not likely to be taken seriously. On the other hand, his effective answers to the earlier criticisms of ESP work will and should carry weight with them. In a word, he has himself rounded out a fair case for ESP for all but the utter cynics who can accept his fantastic suspicion of a vicious conspiracy among academic research workers and a monstrous half-century-long hoax.

Finally, and best of all, comes the point that most concerns Price himself. He has focused more neatly than any other reviewer the deadly, menacing sting of the psi research findings. It is of great importance, indeed, for parapsychology to have the point of this issue brought out sharply and clearly in the pages of *Science* itself! I myself, in a voice scarcely audible in conventional science, have been shouting from the housetops the very same issue that Price has drawn. It is the head-on collision between the facts of parapsychology and the prevailing physicalistic theory of man (or call it mechanism as he does, or materialism, or physical monism, or whatnot). The fact is that this philosophy, on the one hand, and these experimental facts, on the other hand, directly contradict each other in an inescapable, horn-locking manner. Walker (*1*) and Boring (*2*), among others, while they have sparingly admitted in recent publications that there are some experimental results in parapsychology that have to be dealt with, have failed to see the lethal blow that these research results give to the belief in physicalism that both authors espouse. They hold out, rather, for some future, more elastic, physicalistic concept that may eventually account for these puzzling findings of today.

Ignoring his language, I prefer Price's forthright demand for the balancing of the books right now. He, even more than any other critical reviewer, gives indication of having felt the force of the evidence for ESP. When he turns then—albeit a bit too emotionally—and says that, according to the current concept of nature, ESP is impossible and therefore the parapsychologists must all be fakers, he at least draws the issue where it can be squarely met. The answer of the parapsychologist is: "Yes, either the present mechanistic theory of man *is* wrong—that is, fundamentally incomplete—or, of course, the parapsychologists *are* all utterly mistaken." *One* of these opponents is wrong; take it, now, from the pages of *Science!* This recognition of the issue gives point to the findings of parapsychology in a way none can easily miss.

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Mechanistic Assumption versus Experimental Facts: the Setting

Need I ask now—above all, in *Science*—what a scientist should do when a metaphysical doctrine such as this mechanistic philosophy of man is contradicted by a set of experimental results? It is surely part of one's elementary training that one proceeds as Newton, Darwin, Pasteur, and others have exemplified in all the sciences of nature. Generally speaking, the scientist concentrates on the reexamination and confirmation of his facts until, if they bear up under these demands, the opposing belief itself gives way and a modified philosophy of nature develops—one that accommodates itself fully to the new discoveries. If, on the other hand, errors are found, they are specifically exposed and that ends the matter; but, as Price himself has explained, the better ESP work has not been successfully attacked on that score.

It may make the facts of the psi investigations more understandable to retrace from the beginning, at least in outline, the course over which the inquiries in parapsychology have progressed (*3*). (We might also watch for any magic or supernaturalism along the way!) It is a course typical of the introductory history of any natural science. The investigations first arose, as in most other sciences, because of spontaneous natural ocurrences. In this case, certain puzzling and unclassified human experiences started the whole inquiry. These experiences suggested that there might be a way of communication by the mere transference of thought; this was eventually called telepathy. Such communication had not appeared to be very reliable, however, and hence its possibility was neglected as unimportant until a stage in Western culture had been reached at which circumstances gave it increased importance. This new significance had nothing to do with practical utilization and, accordingly, a high order of reliability was not important.

Rather, it was its bearing on the theory of man that brought telepathy to the attention of science. When, in the latter half of the 19th century, materialism severely challenged the traditional spiritual view of man, there were those who thought that the claims of telepathy ought to be looked into because they suggested that a transfer of thought could occur between persons without physical intermediation. Such an operation was taken as mind-to-mind contact transcending the scope of physical explanation. It seemed, therefore, to constitute a challenge to the claim of materialism as a complete theory of human life. Hence it was the very issue that upset Price that led to the rise of parapsychology in the first place.

Eventually—by the 1870's and 1880's—experiments in telepathy were conducted and reports of them got into print. These were criticized and in due time new ones with methods modified to meet the objections were carried out. These in turn were published and received criticism, and so the cycle of all exploratory science progressed. It was not, however, until the second and third decades of the present century that the study of telepathy and extrasensory perception in general began to gain a foothold in university laboratories. But with more concentrated studies in the 1930's and 1940's, finally the professions most concerned were more or less compelled to take notice of the researches in ESP. National organizations of psychologists, statisticians, biologists, and certain medical groups in Europe and America held symposia for the appraisal of the results and claims of parapsychology. The case for ESP not only stood the test, but even more, its status gradually improved. Today, even if the only criterion were Price's type of article, it would be safe to say that ESP is making its way. Parapsychology now occupies an officially recognized place in a half dozen or more leading universities of the world, ranging from fellowships to professorships and from lectures to laboratories.

What Evidence Has Mechanism?

If, then, it was to refute the mechanistic philosophy that parapsychology arose, it is not enough for the inquirer to consider only the evidence of psi. He needs also to ask: How strong a case has been made for the philosophy that opposes it? What evidence is there for a belief in the complete dominion of physical law over man and nature? As a universal law, this claim has never had *any* truly experimental confirmation whatsoever. How in the nature of things could it have? Actually, this whole mechanistic business means only that in those areas of nature in which most of the scientists of the world have been working—the various physical sciences—physical theory *has* been adequate. Naturally. Consequently, mechanism just grew like Topsy and became a habit of mind, a way of looking at the universe. It has even proved successful in dealing with the surface problems of the fields of biology. In the more physiological areas of psychology, too, it has had great success. But to establish that this physicalistic interpretation applies to the whole of nature and that there are no other kinds of principles in the universe would call for a complete understanding of nature. Of course, we have nothing like that, as everyone well knows. As I have said, mechanism is just a habit of mind.

Even one single well-established exception would disqualify a philosophy that is assumed to be an explanation of the entire universe. In particular, any thoroughly physicalistic theory is completely defenseless against such an exceptional case as parapsychology, by its very nature, represents. Recalling, too, that the biological and psychological sciences are still far—and exceedingly far—from explaining most of the basic functions of life and mind, reminds the student of how far present knowledge still is from the final authoritative and incontestably complete view of nature that these hard-shell mechanists take for granted. When anyone gives to such a belief the almost dogmatic finality that Price apparently does, it suggests that the doctrine has taken the place of a security-giving theology and is playing more than a scientific role in his life.

Naturalistic Approach of Parapsychology

Unlike the opposing philosophy of physicalism, the position of parapsychology rests wholly on experimental evidence. These psi phenomena are empirically observed biological effects; they are, more specifically, verified psychological occurrences and they have been strictly and objectively demonstrated to be a part of the natural functions of the individual. Moreover, they are lawful and, as research has revealed their conditions and properties, they make sense against the larger background of human and animal life. In fact, the ESP results warn the scientist that again the boundaries of knowledge have been drawn too close and that once more they will have to be extended. Over and over in the past, that has been the way in which the scientific map of the universe has developed.

It is because it *does* fall well outside the present boundary of conventional science that ESP is a challenge to the science of today. Its advantage is that it is an operation of the personality—the only one thus far known—that can, in a controlled experimental manner, be shown to operate with a certain independence of the physical order of nature. Thus it becomes a sort of key to a farther zone of reality that is identified with that least understood of the natural divisions, personality.

In showing effects independent of the time-space criteria of physical nature, the psi function requires the inference of an underlying energetic operation—one that is neither intercepted by the physical end-organs of the sensory system nor limited by the physical conditions that affect the more familiar energies. Yet, as the discoveries in psychokinesis have

shown, this inferred mental energy, if we may call it that, is convertible into a measurable kinetic operation. Moreover, a lawful and rationally consistent picture is emerging bit by bit from exploratory studies now going on. The results are proving to be organizable and their relationships are proving to be logically coherent. Nonphysical though psi appears to be as judged by the familiar criteria of space and time, it is, nonetheless, a natural function of the normal personality, a part of the living organism and as much a part of the process system of nature as anything already in the books. Its properties, as far as they are known, have been studied by the standards and methodology of natural science in general. No favors have been asked and no concessions are needed that are not claimed by general psychology or genetics or nuclear physics or any other branch of research.

The extraordinarily hidden character of the operation of psi, however, has made its practical utilization difficult. It has also made its scientific demonstration a tedious and long-drawn-out affair. The elusive character of this deeply unconscious function of the personality still gives serious trouble in the research laboratory, as the literature amply recognizes. In fact, unless and until psi ability can be made subject to conscious control, or a device for releasing it on the unconscious level can be developed, it is hard now to see how to bring it to the fruition of ready application that Price outlined. But in any case, no claims are made in advance. The same deeply buried character of the psi function suggests, along with other indications, that psi ability has had an early evolutionary origin. Moreover, a vast storehouse of animal behavior—for example, homing—has been found lying recorded but unexplained since the days of Darwin; this behavior suggests a rich field of possible psi manifestation and application.

The brief outline I have given of what has been done in the investigation of ESP and in the interpretation of the results has been presented in order to "naturalize" it for readers who may have misconceived the whole field as an unrealistic, occult business. It can be seen, however, that except for the fact that parapsychology has turned up a type of phenomena strange to the conventional sciences, the course of development of this branch of science has followed that of a typical naturalistic and objective inquiry. The new facts themselves actually fit well enough into the systematized knowledge already familiar. The clash—and there *is* an unmistakable one—is only with the wholly theoretical philosophy of materialism. There, however, the conflict is complete and inescapable. That, of course, is what makes the findings of parapsychology controversial. It is also what makes the findings of parapsychology revolutionary.

Price's Objective

This is, I trust, my last reply to criticisms of ESP—the last of a 20-year series—for Price has evidently "thrown the book." As he well indicates, however, there was nothing much left to say against the evidence of ESP when he took over; nothing, that is, but a few last resort name-callings, and now he has used up that reserve. On this level of discourse, he may have the last word for whatever it is worth to history. Some readers of Price's article, however, who are not familiar with parapsychology, may incline to take his objective too seriously. For them I have a few remarks.

Actually, his article appears to me rather more like an *act* than a genuine earnest critique. Take, for example, the charge of fraud—one that would ordinarily be a matter of dead seriousness. It is fairly obvious, I think, from the record alone that Price did not really believe what he tossed off without pretense of proof. Had he honestly believed there was fraud, the same impulse that led him to write this article would almost certainly have impelled him to dig up some tangible evidence concerning at least one parapsychologist. Such investigations have actually been made more than once in the past by persons who sincerely wanted to know.

Again, the experimental proposal Price flung at the parapsychologists looks just as much like a pose as the character-knifing act. After first declaring ESP philosophically so completely impossible as to justify his wholesale suspicions of fraud, he then proceeded to demand that the parapsychologists nevertheless conduct a fantastic new experiment of his designing—one that would, he implies, convince him if it gave positive results. The latter sounds open-minded, does it not? All he needs is evidence and the impossible would be possible. Price is either confused or else, as I think, he is proposing this experiment with his tongue in his cheek. Or does it matter? Certainly not so far as it concerns the values I have credited to the publication of this paper.

There were such challenges as Price's in the 1930's. The now classic Pratt and Woodruff (*4*) experiment in ESP was carried out to meet one that was made jointly by seven American psychologists. Pratt and Woodruff exceeded the precautionary standards submitted and their experiment was successful too; but the net effect on the seven psychologists was that it merely silenced them; it did not convince them. S. G. Soal, who was especially singled out for suspicion by Price, was himself at one time one of the leading challengers of the Duke experiments. His own negative results from years of work proved, however, on reanalysis, to contain significant evidence of ESP, and the conversion of Soal from critic to colleague stopped a lot of criticism of ESP in the 1940's. Knowing all this as he must, Price can hardly be entirely serious in his talk of conspiracy in the Soal experiments and his demand for a so-called fraud-proof experiment.

Perhaps it is enough to suggest rather that ESP has now approached the status of "big game" and one may not need to search for any other purpose than that of the hunter's impulse to bring it down. Whatever the motive, the value of the publication of Price's article in *Science* stands out well above any other consideration whatever, and it would be a mistake to overlook this outstanding service to parapsychology in the consideration of minor defects. The designing of the experiments for that field can perhaps be left to those with more experience. But it took Price, whether trophy-hunter or sincere scientist, to get nine pages on parapsychology into a lead article in *Science,* with the crucial challenge of that field sticking out like a sore thumb.

American Way of Science?

This final point is not made on behalf of parapsychology but is beamed at science in general. It is something that I have culled from my prolonged participation in what has probably been one of science's fiercest controversies. Naturally, I have had to wait to mention it for the time when parapsychology was safely through its ordeal. Has that time come? Price could hardly have kicked a *dead* horse (or even a very sick one) through nine full pages of the world's leading scientific periodical.

American science, I am convinced, badly needs a forum—a journal that is open to new work, however radical its implications, without the usual practice of waiting for a savage attack to make it admissible. It is, of course, what might be called the forum attitude that is lacking. Yet it will be freely recognized by all that fair and unhampered presentation of revolutionary ideas and discoveries is especially vital to the continued advancement of inquiry. The national interest itself obviously requires the active cultivation of unrestricted investigation. It seems likely that the well-known lag of American science (omitting technology) behind European contributions in the more fundamental researches of the last 50 years (for example, in psychology and physics) is due entirely to this one distinct difference, this greater inhospitality to novel and unconventional claims that prevails in the United States.

Through the anxious years coming up, man's fitness to survive what already hangs over his head may easily depend on how well and how fast his scientists can think. But who knows what this thinking is worth until it is known—until it is made readily available in the forum, the symposium, and the periodical? It is time, and it is urgent, to borrow from the engineers their successful practice of reaching out for, instead of fending off, novel claims and unorthodox discoveries, of clarifying their status promptly and in general encouraging the creative turn of mind—and to extend this practice to areas beyond that of gadgetry and invention, areas that have to do with the understanding of man and the guiding values of life.

In this last section I have been attempting to say that Price's article is perhaps more revealing with regard to the need in American science for a more tolerant attitude than it is of the status of the struggling young science of parapsychology on which it has made a curious, bludgeoning attack. Parapsychology can now take care of itself, I think, but what about American science?

References and Notes

1. R. Walker, *Sci. Monthly* 79, 1 (1954).
2. E. G. Boring, *Am. Scientist* 43, 109 (1955).
3. I will furnish, on request, a reading list to those who may wish to go over the course more fully.
4. J. G. Pratt and J. L. Woodruff, *J. Parapsychol.* 3, 121 (1939).

Compatibility of Science and ESP

Paul E. Meehl and Michael Scriven

As two of the people whose comments on an early draft of George Price's article on "Science and the supernatural" he acknowledged in a footnote, we should like to clarify our position by presenting the following remarks.

Price's argument stands or falls on two hypotheses, only the first of which he appears to defend. They are (i) that extrasensory perception (ESP) is incompatible with modern science and (ii) that modern science is complete and correct.

If ESP is *not* incompatible with modern science, then the Humean skeptic has no opportunity to insist on believing modern science rather than the reports about ESP. If modern science is *not* believed to be complete or correct, then the skeptic is hardly justified in issuing a priori allegations of fraud about experimenters even when they claim that they have discovered a new phenomenon that requires reconsideration of the accepted theories.

In our view, both of Price's hypotheses are untenable. Whatever one may think about the comprehensiveness and finality of modern physics, it would surely be rash to insist that we can reject out of hand any claims of revolutionary discoveries in the field of psychology. Price is in exactly the position of a man who might have insisted that Michelson and Morley were liars because the evidence for the physical theory of that time was stronger than that for the veracity of these experimenters. The list of those who have insisted on the impossibility of fundamental changes in the current physical theory of their time is a rather sorry one. Moreover, unhappy though Price's position would be if this were his only commitment, he cannot even claim that specifiable laws of physics are violated; it is only certain philosophical characteristics of such laws that are said to be absent from those governing the new phenomena.

It is true that Price attempted to give a specific account of the incompatibilities between ESP and modern science, rather than relying on Broad's philosophical analysis, but here the somewhat superficial nature of Price's considerations becomes clear. Of his eight charges, seven are unjustified.

1) He claims that ESP is "unattenuated by distance" and hence is incompatible with modern science. But, as is pointed out in several of the books he refers to, since we have no knowledge of the minimum effective signal strength for extrasensory perception, the original signal may well be enormously attenuated by distance and still function at long range.

2) He says that ESP is "apparently unaffected by shielding." But shielding may well have an effect: the evidence shows only that the kind of shielding appropriate to electromagnetic radiation is ineffectual; since detectors indicate that no such radiation reaches the percipient from the agent, this is scarcely surprising.

3) He says "Dye patterns . . . are read in the dark; how does one detect a trace of dye without shining a light on it?" The two most obvious answers would be by chemical analysis and physical study of the impression (which is usually different for different colors).

4) "Patterns on cards in the center of a pack are read without interference from other cards." The word *read* is hardly justified in view of the statistical nature of the results; however, this phenomenon is always used by parapsychologists as evidence against a simple radiation theory, which it is. But no simple radiation theory can explain the Pauli principle and one can no more refute it by saying "How could one electron possibly know what the others are doing?" than one can refute the ESP experiments by saying "How could one possibly read a card from the middle of the pack without interference from those next to it?" These questions are couched in prejudicial terms.

5) "We have found in the body no structure to associate with the alleged functions." Even if true, this hardly differentiates it from a good many other *known* functions; and among eminent neurophysiologists, J. C. Eccles is one who has denied Price's premise [originally in *Nature* **168** (1951)].

6) "There is no learning but, instead, a tendency toward complete loss of ability" a characteristic which Price believes has "no parallel among established mental functions." Now it would be reasonable to expect, in a series of experiments intended to show that learning does not occur, some *trial-by-trial* differential reinforcement procedure. Mere continuation, with encouragement or condemnation after *runs of many trials* can hardly provide a conclusive proof of the absence of learning in a complex situation. We ourselves know of *no* experiments in which this condition has been met and which show *absence* of learning; certainly one could not claim that this absence was established. Furthermore, *even if it had been established,* it would be very dan-

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