earth-centred one, and Darwin's theory of evolution were both greeted with violent opposition. Astrology and 'creation science' provide excellent illustrations of how pseudoscience prefers the arcane and impossible to the newly discovered and probable as yesterday's scientific orthodoxy becomes today's pseudoscientific unorthodoxy. Carlson's article on astrology shows how poorly astrological theory fares when it is subject to properly controlled double-blind trials and statistical investigations. Hewitt examines 'creation science' and another example of parabiology, the 'hundredth monkey phenomenon'. As Stephen Jay Gould recently pointed out, 'creation science' is an oxymoron [2]. Yet in the USA, the state of Louisiana is currently attempting to force public schools to teach 'creation science' as part of normal science courses concerned with the origins of the earth, human and other life forms. These cover enormous areas of the curriculum: anthropology, astronomy, biology, chemistry, geology, and physics. An *amicus curiae* brief signed by 24 scientific organisations, including the Committee for the Scientific Investigation of Claims of the Paranormal, and 72 Nobel laureates, has been submitted to the Supreme Court asking it to declare the Louisiana statute invalid. The court's judgement will have profound implications for science education in the USA.

Skrabanek provides an illuminating account of paranormal health claims, another area where human credulity has been successfully stretched to the limit. Leikind and McCarthy's article focuses on a single claim, that of fire walking, currently a commercialized fad in parts of the USA and Japan, and elsewhere.

Hyman's article provides a methodological critique of some of the best experimental work in parapsychology. Hyman begins with the first experimental work conducted by the Society for Psychical Research reported in the 1880's regarded by many as the first definitive experiment. In bringing his scholarly critique up to the present with analyses of the ganzfeld and random number generator research, Hyman finds the modern methodology wanting, even when assessed using the criteria of the parapsychologists themselves. In similar vein, Scott critiques the methodology of the remote viewing studies which, in the late 1970s, were acclaimed to provide the strongest evidence for ESP amongst parapsychologists.

Given that the scientific evidence for the paranormal is so weak, we are left with the intriguing question of why so many people believe in the paranormal. Dutton provides an analysis of the craft processes through which a person can convince complete strangers that he/she can 'read their minds'. Dutton's research was largely inspired by the now classic article on cold reading by Hyman [3]. The final article reviews a number of the psychological processes which appear to stimulate and sustain paranormal belief formation. It also examines recent research on educational approaches to the development of critical thinking among science students with whom the fate of science ultimately rests.

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2 Gould, S. J., 'Creation Science' is an oxymoron. Skeptical Inquirer *11* (1986-7) 152–153.

3 Hyman, R., 'Cold reading': How to convince strangers that you know all about them. The Zetetic *1* (1977) 18–37.

4 Marks, D. F., Investigating the paranormal. Nature *320* (1986) 119–124.

5 Sagan, S., Night walkers and mystery mongers: sense and nonsense at the edge of science. Skeptical Inquirer *10* (1986) 218–228.

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Skepticism about the paranormal: Legitimate and illegitimate

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Summary. With the growth of belief in the paranormal, skepticism can play a vital role in the scientific appraisal of claims. There are two forms: the first, hardly legitimate, is negative or total skepticism. It is nihilistic and dogmatic, and essentially self-defeating and self-contradictory. The second, a legitimate form, is selective skepticism. Here skepticism operates as a methodological principle of inquiry, testing hypotheses and theories in the light of evidence, but always open to new departures in thought. Skepticism has been applied historically to epistemology, metaphysics, religion, and ethics. The paranormal field has been full of fraud. Here the skeptic insists upon replicable experiments by neutral or skeptical observers before he will accept a claim as confirmed.

Key words. Skepticism; paranormal; parapsychology; psychical research; replication.

Introduction

Skepticism is an intellectual position that has had a long but checkered career in the history of thought. There is a distinguished list of philosophers and scientists who have identified themselves with its principles.

On the contemporary scene, where belief in so-called paranormal phenomena is widespread, there is a point of view which may also be characterized as skeptical. In the area of parapsychology, it concerns claims about ESP, clairvoyance, telepathy, precognition, psychokinesis, or psychic healing, and the reliability of parapsychology as an experimental science. In UFOlogy, skeptics have examined the evidence for the claim that extraterrestrial intelligent beings have visited our planet, in the past and present, and they doubt whether the evidence is sufficient to establish the claim. In astrology, skeptics have questioned the veracity of horoscopes and astrological charts and forecasts, and similarly, have questioned many other fascinating claims that have been made about a paranormal universe. Messengers from Thebes were executed when they reported that a battle had been lost, and many disciples of the paranormal would apparently wish to

do the same to the bearers of negative tidings about the paranormal if they had the chance. No doubt some skeptics have been extreme in their debunking efforts and are open to some criticism, but others have been moderate and reasonable.

The point is, there are many forms of skepticism that can be identified. Some of these appear to be perfectly legitimate and appropriate, indeed part of the very structure of scientific methodology and an essential ingredient in the attitude of any reflective person. Some forms of skepticism, however, are illegitimate and unwarranted and border on dogmatic rejection, and the critics of these forms of skepticism have good grounds for objecting, for there is obviously a need for skeptics to be skeptical of their own alleged objectivity.

In this paper I provide a general definition and characterization of skepticism in its various forms and indicate the relevance of this discussion to claims of the paranormal.

Two types of skepticism

I wish to focus on two main types of skepticism. First, there is what we may call negative or *total skepticism,* in which the very possibility of knowledge or truth is denied, whether about the external world or the moral life. This is unlimited doubt in its extreme form; it may be reduced to subjectivism, solipsism or even nihilism. In my view this position is self-defeating and self-contradictory, and although we learn a great deal from it about the fragility of our first principles, it does not take us very far in developing knowledge. The second kind of skepticism is of a positive kind which we may call *selective skepticism,* in which skepticism operates as a methodological principle of inquiry. For this form of skepticism, doubt is always contextual and focuses on specific research problems that are raised by inquirers. It grows out of a 'real and living doubt' as Charles Peirce called it [24], and focuses on problematic questions as they arise in the course of inquiry. Hypotheses are offered to settle the doubt, answer the questions, resolve the problem. Hence doubt is only partial, not total; it is selective in character, not universal. One takes an hypothesis as tentative and only confirms it on the basis of the evidence. Hypotheses and theories are never absolutely certain. Since we may be in error or since new data may be uncovered, the principle of fallibility emerges. Namely, we must always be prepared to revise our hypotheses or theories in the light of new evidence and theories, but only if alternative explanations seem more adequate in accounting for the data. This approach, in my view, is essential to all meaningful investigation and research. There are various shades of skepticism, no doubt, between these two forms. We are chastened by the first kind of skepticism as we contemplate nothingness, but we can only function in terms of the second if we are to pursue our goals in the world. Let me develop the discussion on the second kind of skepticism by reference to four kinds of problems that skeptics have puzzled over and indicate the differences in approach:

1. First is what we may call *epistemological skepticism.* This is concerned with the nature and limits of knowledge. It asks: What are the methods that are most effective in discovering knowledge? What are the tests or criteria of truth, if any? The first position of unlimited or negative skepticism denies that any knowledge is reliable. It also denies that there are any objective standards for testing truth claims. In its extreme form, it degenerates into epistemological anarchism or subjectivism, for it maintains that we cannot rely on any method and that one is as good as the next. Paul Feyerabend, the philosopher of science, holds this position [9]. However, it becomes self-contradictory even to maintain this position, for if one asserts that 'No knowledge is reliable,' then neither is this statement reliable unless one wants to assert that 'All statements are unreliable except this one.' But if so, there is at least one sentence that is reliable; but one could not give supporting reasons for it, for this would mean that other statements in defense of the first are reliable. Perhaps the only intellectually definable position is to wiggle one's finger, for no intellectual position makes any more sense than any other.

There is another kind of epistemological skepticism which I submit makes eminent sense, and that is a qualified or selective skepticism. Here the skeptic recognizes that we cannot make absolute, ultimate, or final statements about the world or about our criteria for judging statements about the world. There is no such thing as *the* scientific method, but there are many methods and techniques that are used, and there are *some* standards by which we gauge the reliability of statements. In asserting this, we appreciate the fact that human knowledge is fallible and may be mistaken, that it should be taken as tentative and open to possible revision, that any claims, particularly about the world, that aim to be empirical, should be held only on probable grounds, and that our assent to truth claims is a function of the degrees of evidence adduced in their support. This even applies to mathematics and logic, which may be considered to be postulational [15].

2. We may also distinguish *ontological* or *metaphysical skepticism,* and this concerns our interpretation of the external world and the nature of reality beyond our own sense data or impressions, and maintaining that it is ultimately unfathomable and unknowable. The selective skeptic, on the contrary, recognizes the limitations imposed by our egocentric predicaments, but nonetheless he believes that we can and do formulate hypotheses about the world, and that these are testable to some extent. Even if our knowledge cannot be readily reduced to any one set of simples (as some materialists and idealists think), nonetheless there are levels of explanation, and our knowledge is a function of the context of the inquiry. He is also skeptical about finding 'ultimates' in the universe, and he views science primarily as a method of inquiry, as a tool or instrument of understanding, helping us to make predictions and enabling us to offer tentative explanations as best we can [22].

3. In the area of *religious skepticism,* the negative skeptic is most often a militant or even dogmatic atheist, who decisively rejects belief in the existence of God. Or his argument may be made from totally agnostic grounds, in which he claims that the existence of God transcends the range of any possible human experience and cannot be given pro or con. Presumably the selective skeptic is also dubious about theistic claims, and may be an atheist or agnostic. He believes that all these questions are arguable, however, and he may seek to engage in dialogue and investigation with unbelievers, at least with those who are willing to enter into critical inquiry with him. He believes that the burden of proof is upon the theist and is willing to examine his supporting arguments and evidence. Generally, he does not think that the believer has made his case [19].

4. *Ethical skepticism* has been central to a good part of the twentieth century literature of ethics and philosophy. This discussion primarily concerns two kinds of questions: a) Is it possible to define our basic moral terms and concepts, such as 'good,' 'bad,' 'right,' and 'wrong'?, and b) Can we formulate objective moral judgements? Are there moral truths? The negative skeptic denies that we can define normative terms without committing the 'naturalistic fallacy' or engaging in mere 'persuasive definitions,' because such terms, he says, are simply expressive and imperative in function. Moreover, he maintains that it is impossible in the last analysis to develop any objective tests or moral truth claims, and he ends up with a kind of subjectivism and relativity of taste. When there are disagreements in attitude, he says, if one cannot persuade other people to accept his feelings, then in the last analysis he may have to resort to force, not argu-

ment. A qualified form of ethical skepticism – ethical naturalism – appreciates the critique of the nihilist. He argues that value judgements and ethical principles are relative to human experience and/or human societies. Nonetheless, he argues, some degree of objective criticism is possible, and values and standards can be modified in the light of the facts of the case, means-end considerations, and knowledge of consequences. We can modify the values that we have, which are based upon our emotions, and we can transform them into appraisals based upon cognition. It is possible, at least in principle, to resolve many or most ethical disagreements, if people share common methods of negotiation and compromise. The qualified ethical skeptic, however, doesn't believe that his values or principles are absolute or universal. They are tested in human experience by their consequences in action [8, 17].

It is clear that this second kind of skepticism that I have been talking about does not throw into question the entire validity of human knowledge or of the reality of an independent world. It does not reject out of hand a priori all discussions of God or the theistic hypothesis, nor does it deny the possibility of moral wisdom or the use of intelligence in solving human problems.

Appraising claims of the paranormal

What is the relevance of my discussion to evaluating claims that are made on behalf of the paranormal? The term 'paranormal' refers to alleged phenomena and hypotheses offered to account for these anomalous data that do not readily fit into the existing conceptual framework of science at any one time in history. For some, such anomalistic data seem to resist any naturalistic causal explanations and to even contradict the physicalist presuppositions of the physical sciences. What is or should be the appropriate response of the skeptic to such claims? What indeed should be the skeptic's response to any and all new discoveries or claims to knowledge that are novel or revolutionary? This is a constant issue both within the established sciences and outside of them. During certain epochs there may be daring new hypotheses offered within any given science, which would, if accepted, require a rather fundamental alteration of prevailing scientific theories. The best illustration of this is Alfred Wegener's shifting continents theory, which when first introduced in the earlier part of this century was almost universally rejected by earth scientists [39]. Today, it has been incorporated into the body of knowledge and is widely accepted, thus overthrowing earlier, supposedly well-established theories. I might add that this occurred primarily because new evidence was discovered which supported the hypothesis and which had been unavailable earlier. Similar considerations apply to the evaluation of emerging fields of knowledge, alleged 'proto-sciences', which constantly appear. Psychic surgery, acupuncture, chiropractic and psychoanalysis are often criticized by some in the medical profession as unfounded, and still other fields, such as parapsychology, astrology, holistic medicine, etc., battle for recognition from scientists. Which of these fields are valid and which are invalid?

I take it that there are two possible postures of the skeptic, with positions graded between. The first is that of the negative skeptic who totally rejects the claims made in the new field of study as 'bogus' or 'pseudoscientific.' His arguments are generally three-fold: a) the findings contradict or violate the conceptual scheme of the prevailing 'basic limiting principles' (as C.D. Broad called them) [2], and hence are not to be accepted until such time as these fundamental concepts are radically altered or overthrown: b) there are no evidential groups for the proto-science or at the very least there is insufficiently corroborative evidence for the claims made on its behalf; and c) the most extreme assertion made in criticism is that those who are studied or do the studying are naive fools, charlatans or frauds. Some of the criticisms made by skeptics of fields of alleged paranormal inquiry are surely exaggerated forms of overkill, and one can understand why some paranormal researchers would like to treat the skeptics as the proverbial messengers from Thebes. I submit that some forms of this kind of strong debunking are justified, but only where excessive pro-paranormal puffery is offered to the general public in the name of science. Some of it is no doubt misdirected and is not legitimate. Pure nonsense may deserve strong debunking, and this applies to psychics, astrologers, and other gurus who prey on an unsuspecting public, exhibiting and selling wares to unwary individuals. The skeptic is, if nothing else, a consumers' advocate or Socratic gadfly, and although he may be persona non grata in some circles, he is heir to an illustrious debunking tradition that has many precursors in the world of ideas: Socrates, Lucian, Montaigne, Hume, Voltaire, Nietzsche, Bertrand Russel, H. L. Mencken and others [26, 27]. This may be the only appropriate response to those who seek to fleece a gullible public, and it is a real problem in the broader culture where we often face strong anti-scientific and pseudo-scientific attitudes that need to be countered.

Basically, however, this is not the appropriate response that should be made within the science to serious researchers on the frontiers of knowledge who may present novel or radical ideas that demand responsible critical analysis and appraisal. There is always some danger that a new science will be ruled out of court by mockery and derision, and that the truths that researchers have discovered or the new paths that they may have chartered will be suppressed or ignored by the scientific establishments of their day. This caution should be applied to the field of cryptozoology, for example, which investigates the possibility of new animals and species being discovered. One can not foreclose that occurrence and must be willing to examine claims without prejudgment – gorillas were discovered rather late, and the quest for deep-sea monsters goes on today. The disciples of Immanuel Velikovsky accused the establishment of rejecting him without a fair hearing. His views may be mistaken, but surely they deserved (and eventually received) responsible investigation [13, 34].

The Galileo principle, of course, commands our respects: do not reject a serious claim simply because it contradicts or overthrows basic or well-established principles held by the leading scientists of the day. In regard to new fields, a proto-science may be a fledgling new science, not a pseudoscience. Within the established fields, the new theories may turn out to be correct and the old ones may need to be rejected. Not all of the candidates for Galileo's mantle merit the honor, but enough cases in the history of science have proven worthy that we must approach novel ideas with caution. This is the approach that I submit, of selective skepticism as distinct from total or unlimited skepticism.

I wish to outline what I think the legitimate role of skepticism is or should be in appraising such claims. There are a number of questions to be asked. First, not every fanciful idea or theory deserves an equal hearing by scientific investigators or intellectuals. Some may be beyond the pale of comprehension, so unclear and confused that no identifiable meanings or possible interpretation can be assigned to them. I am thinking here of the wide number of mystical, metaphysical, or occult faiths that people hold. The transcendental temptation is a powerful impulse in human history. Clearly, we need an open mind toward new departures in thought. But the scientific revolution could occur only when investigators could move beyond vague, intuitive speculations and frame meaningful questions and testable hypotheses. Science can only deal with empirical claims and coherent, internally consistent theories that are capable of some form of resolution. Many ideas that are presented may be frivolous or

subjectivistic and incapable of verification. My remarks apply in part to astrology or fortune telling, where privatistic claims are made about success rates, but no coherent theory is presented for testing them. I do think that many astrological predictions are testable, however, in statistical and experimental terms, and that these tests can be and have been performed [5-7]. Popper was mistaken in applying his non-falsifiability criterion here [28, 38]. Presumably, we can only deal with those claims that are responsibly held and that indicate some possibility of confirmation. The open mind must be distinguished from the open trap, which accepts for evaluation any and every claim to truth uncritically. I hope that this does not preclude examining anything that might be considered to be intellectually worthwhile or might possibly contribute to the fund of human knowledge.

Second, a given hypothesis, idea or theory may or may not conflict with the existing body of hypotheses, laws or theories. Here Hume's celebrated principle concerning miracles comes forth, for Hume argued that where a belief conflicts with a body of other well-tested beliefs, there must be a good deal of evidence in its favor if we are to accept it [16]. We simply have to weigh probabilities and accept the strongest. This cannot be taken as a decisive argument against paranormal claims, for there is always the danger that Hume's argument about miracles might be used to ridicule or block novel ideas. There are scientific prejudices and habits of thought that are difficult to overcome. The existing body of accepted principles should not be taken as ultimate, nor function as a censor. Dogmatic skepticism is destructive when it labels as 'ludicrous' anything within science that threatens its world view. Yet if Hume's argument cannot be used as an infallible guide for invalidating anomalous claims, it does provide some prima facie ground at least for being cautious about those claims that violate well-established principles or theories that are based on substantial evidence. Thus there is merit in questioning parapsychological claims: precognition or psychokinesis may be true. We cannot rule them out on a priori grounds, and I think that any effort to do so by conceptual analysis is in error. The saving grace to Hume's argument is that if the data are to be accepted, then we should have a sufficiently high probability that it has occurred. Extraordinary claims that overturn other well-established observations and hypotheses require not simply fragmentary evidence, but strong evidence that is incontestable.

Thus, the third point which I think essential is the need for a replicable experiment. Indeed, this appears to me to be the single most important argument offered by skeptical critics today. Is there sufficient evidence for a claim? The evidence must be uncontaminated by experimental bias, bad protocol, sensory leakage, or scoring errors. Before we can overthrow basic limiting principles that are based upon a wide range of experimental confirmations, the existence of confirming evidence should be so clear and reliable that a modification of the earlier causal hypothesis is the only reasonable alternative.

Fourth, another important criterion in evaluating paranormal claims is the 'burden of proof' argument. The skeptic maintains that the burden of proof is upon the claimant to first show that there are sufficient evidence and reasons for testing his hypothesis. The grounds for a claim must be strong before it can be accepted for testing. The burden is not upon the skeptic to disprove the claim or prove the negative – often a very difficult task. I think that it is a mistake to argue that in principle one cannot prove a negative. Under certain conditions it is possible to do so. It depends upon the nature of the claim and the specificity of its range of application [19, 23]. If someone asserts that a mermaid (or ri or dugong) is in my bathtub or swimming pool, I can inspect either and prove the negative. There is no mermaid in either place. It may be more difficult to disprove a claim that a mermaid is in Lake George, but the lake is still small enough so that it is possible to disconfirm this claim. It is far more difficult to disprove the claim that mermaids exist in the oceans of the world given their vastness. In such cases one would have to ask for proof positive. Whether Bigfoot exists or UFOs are extraterrestrial or psychokinesis is a fact – any of these may be the case – cannot be made as universal or general claims; one must specify the particular circumstances and conditions under which such phenomena have been or can be observed.

There is a fundamental difference between logical possibility and empirical probability. Some claims made may be logically impossible. Thus we cannot even speak intelligibly about square circles, let alone to know where to look for them in the real world. Other concepts may be within range of possibility, and antecedent logical objections raised against them are inadmissible. What is logically impossible is sometimes difficult to ascertain. Antony Flew asks whether a person can view his own funeral and he rejects such talk as unintelligible for it violates our usual categories of discourse [10]. But I am concerned that such conceptual difficulties not be adduced to negate the claim. Although it is difficult to conceive of how one might see without a retina or brain, one cannot foreclose this on logical grounds. And dualists insist that it makes sense to so talk. It is a question of *evidence* for the claim. The real issue for most questions is whether the claims made are improbable or probable. Extraterrestrial visitation is surely possible, at least it is not necessarily impossible. Although it does not violate the laws of logic to conceive of creatures from afar visiting us, it may be difficult or improbable or statistically rare for it to happen, given the great distances in space and time, as some astronomers have held. But I would hate the matter to rest solely on forms of a priori reasoning. Whether UFOs are extraterrestrial in origin depends upon the reliability of the evidence and of the witnesses and the relevance of alternative prosaic explanations for the phenomena. I have no doubt that millions of people have observed strange phenomena in the sky, but whether the ET account is the one that best befits these observations is questionable. Perhaps what we need to investigate more thoroughly is the psychology of perception and the sociology of belief; for I have found that at some point everyone has imagined that he has seen anything or everything, however bizarre. Uncorroborated and uninterpreted testimony is often dubious – as many psychologists have pointed out. In any case, the burden of proof is upon the claimant to bring to bear hard evidence for his claim.

The problem of fraud

No doubt of great importance in the paranormal field is the problem of fraud. The field of psychic research and spiritualism has been so notoriously full of charlatans, from the Fox sisters to Uri Geller – individuals who claim to have special powers and gifts but who are actually conjurers who have hoodwinked scientists and the public as well – that we have to be especially cautious about claims made on their behalf [4, 14, 18, 29].

Eusapia Palladino is a good case in point. She was one of the most widely-tested mediums of all time. A number of distinguished scientists submitted her powers to exhaustive testing in the early part of the century, and were convinced by what they saw. She was caught red-handed in blatant acts of fraud by members of the Society for Psychical Research in Cambridge and by scientific teams at Columbia and Harvard Universities [18, 32, 34]. She was shown to be substituting her hand or foot and using them in darkened seances to move objects so that they appeared to be levitating. Even her defenders conceded that she cheated, at least some of the time.

The problem that puzzles me is this: If one finds sleight-of-hand techniques being used some of the time by such individuals, then why should one accept anything else that is presented by them as genuine? Is not the evidence contaminated? This was the position that SPR took many years ago. Eleanor Sidgwick said that it was the SPR policy not to concern itself with mediums who employed deliberate fraud or were interested in financial gain. An exception was made in 1908 when Everard Feilding, Hereward Carrington, and W. W. Baggally again attempted on behalf of the SPR to test Palladino in Naples[11]. They reported that they could find little clear evidence of fraud in those sittings. On the basis of this, some parapsychologists have argued that the burden of proof is upon the skeptic to give a counter-explanation of how she performed what she did and to show decisively that it was done by trickery. It is a difficult assignment to reconstruct the events after the fact – though my own conjecture in that regard is that Carrington was probably Palladino's accomplice. Skeptics question the first Feilding report because in a subsequent test by Feilding and other tests by scientists, Palladino had been caught cheating[12, 14]. Hugo Munsterberg gave a vivid account of how a confederate of his had crawled under the curtain of the cabinet and caught Palladino in the act of releasing her foot and moving it backward to levitate a table. In this situation, observers on both sides held her hands and feet – or so they thought – but she managed to slip one foot free[14]. The same kind of chicanery was reported by Joseph Rinn at the Columbia University tests[32].

Similar doubts apply to other psychics and mediums of the past who were shown clearly to be using sleight-of-hand. The same consideration applies to the recent case of Tina Resch, caught cheating on the so-called Columbus, Ohio poltergeist case[30]. John Beloff has argued that he is concerned not with the ethics of the psychic or medium but with the genuineness of the phenomena[3]. The skeptic would reply that the alleged phenomena are unreliable once we know that the subject under study will report to cheating.

I surely do not think that all or even most paranormal data can be attributed to fraud, but merely wish to suggest that extreme precaution is in order. This applies to experimenters as well, where the temptation for notoriety or fame or any other kind of recognition may play a role, especially in the light of Levy's work at Duke and the Soal affair. Levy, at J. B. Rhine's laboratory, had published significant results in precognition, but eventually he was caught cheating[31, 33]. S. G. Soal also had, according to many scientists, decisively confirmed the existence of precognition and telepathy, after years of his inability to replicate J. B. Rhine's work. It took some 25 years, however, for the scientific world to be shown by Betty Markwick, Christopher Scott and others that Soal had clearly cheated by altering test scores[20, 21, 35]. Soal's case was a shock to the parapsychological world, but it merely points out again the need for extreme caution.

In spite of these skeptical doubts I reiterate my main point. Selective skepticism, not universal rejection, is essential in appraising the work of parapsychologists. Skeptics need to work cooperatively with paranormal believers in designing, testing and interpreting experimental projects. The question of belief or non-belief is irrelevant. We need neutral investigators whose judgments are determined by the evidence. Human beings are, after all, human, and it may be difficult to entirely abandon one's biases in the laboratory. But ideally that is the only legitimate response as a scientist qua scientist, whose higher loyalty must be to the furtherance of the aims of science and the quest for truth. By the same token it is incumbent on those doing research in this controversial field to join with critics in exposing deceit and error wherever it appears, including in the popular media exploitation of paranormal claims which have no basis in scientific fact.

Conclusions

In conclusion, I wish to reiterate that a selective skepticism is essential to the entire process of scientific and intellectual inquiry. It should apply not only to parapsychology and other paranormal fields but to the established sciences as well. Many respected fields of scientific investigation are also open to strong skeptical criticisms. One should not only single out the paranormal. One surely should not reject all anomalous claims in a sweeping fashion. Nor can one refuse to investigate such claims fairly and dispassionately. If vigorous standards of inquiry have been respected and if there is incontrovertible and replicable evidence to support a hypothesis or theory, then the only legitimate option for skeptical observers committed to the methods of science is to incorporate this hypothesis or theory into the body of established scientific knowledge.

I would hope that those who today are committed in some way to paranormal theories about the universe will appreciate the many doubts of skeptics about their claims, and that they will seek to meet them half way. Our demand, in particular, is that there be replicable experiments made, preferably by neutral or skeptical inquirers. If we are to expand human knowledge, whether in the field of paranormal research or elsewhere, it seems to me that the position of the selective skeptic is the responsible and constructive position to take.

1 Brandon, R., The Spiritualists. Prometheus Books, Buffalo, N.Y. 1984.
2 Broad, C. D., The relevance of psychical research to philosophy. Philosophy *24* (1949) 291–309.
3 Beloff, J., What is your counter-explanation? A plea to skeptics to think again, in: A Skeptic's Handbook of Parapsychology, pp. 359–379. Ed. P. Kurtz. Prometheus Books, Buffalo, N.Y. 1985.
4 Coover, J. E., Metapsychics and the incredulity of psychologists: Psychical research before 1927, in: A Skeptic's Handbook of Parapsychology, pp. 241–274. Ed. Paul Kurtz. Prometheus Books, Buffalo, N.Y. 1985.
5 Culver, R. P., and Ianna, P. A, The Gemini Syndrome: A Scientific Evaluation of Astrology. Prometheus Books, Buffalo, N.Y. 1985.
6 Dean, G., and Mather, A., Recent Advances in Natal Astrology: A Critical Review: 1900–1976. Analogic, Subiaco, Western Australia 1977.
7 Dean, G., Does astrology need to be true? Part 1: A look at the real thing. The Skeptical Inquirer *11* (1986–87) 166–185; and Does astrology need to be true? Part 2: The answer is no. The Skeptical Inquirer *11* (1987) in press.
8 Dewey, J., Theory of Valuation. University of Chicago Press, Chicago 1939.
9 Feyerabend, P., Against Method. Schocken Books, New York 1977.
10 Flew, A. G., Can a Man Witness His Own Funeral? Hibbert J. (1955–56) 242–250.
11 Feilding, E., Baggally, W. E., and Carrington, H., Report on a Series of Sittings with Eusapia Palladino. Proc Soc. psych. Res. *23* (1909) 306–569.
12 Feilding, E., and Marriott, W., Report on a Further Series of Sittings with Eusapia Palladino. Proc. Soc. psych. Res *25* (1911).
13 de Grazia, A. (Ed.), The Velikovsky Affair. University Books, New Jersey 1966.
14 Hansel, C. E. M., ESP and Parapsychology: A Critical Evaluation. Prometheus Books, Buffalo, N.Y. 1980.
15 Hempel, C., Aspects of Scientific Explanation. The Free Press, New York 1965.
16 Hume, D., An Enquiry Concerning Human Understanding, in: The English Philosophers from Bacon to Mill, p. 667. Ed. E. A. Burtt. Modern Library, New York 1930.
17 Kurtz, P., Moral faith and ethical skepticism reconsidered. J. Val. Inq. *19* (1985) 55–67.
18 Kurtz, P., Spiritualists, mediums, and psychics: Some evidence of fraud, in: A Skeptic's Handbook of Parapschology, pp. 177–224. Ed. P. Kurtz. Prometheus Books, Buffalo 1985.
19 Kurtz, P., The Transcendental Temptation: A Critique of Religion and the Paranormal. Prometheus Books, Buffalo 1986.

20 Markwick, B., The Soal-Goldney experiments with Basil Shackleton: New evidence of data manipulation. Proc. Soc. psych. Res. *56* (1978) 250–277.
21 Markwick, B., The establishment of data manipulation in the Soal-Shackleton experiments, in: A Skeptic's Handbook of Parapsychology, pp. 287–312. Ed. P. Kurtz. Prometheus Books, Buffalo, N.Y. 1985.
22 Nagel, E., The Structure of Science. Harcourt, Brace, and World, New York 1961.
23 Pasquarello, T., Proving negatives and the paranormal. The Skeptical Inquirer *8* (1984) 259–270.
24 Peirce, C. S., The fixation of belief, in: The Collected Papers of Charles Sanders Peirce, vol. 5, pp. 223–247. Eds C. Hartshorne and P. Weiss. Harvard University Press, Cambridge 1934.
25 Podmore, F., The Newer Spiritualism. T. Fisher Unwin, London 1910.
26 Popkin, R. A., The History of Scepticism from Erasmus to Spinoza. University of California Press, Berkeley 1979.
27 Popkin, R. A., Scepticism, in: The Encyclopedia of Philosophy, vol. 7, pp. 449–461. Ed. P. Edwards. The Free Press, New York 1967.
28 Popper, K., The Logic of Scientific Discovery. Hutchinson, London 1959.
29 Randi, J., The Truth About Uri Geller. Prometheus Books, Buffalo, N.Y. 1982.
30 Randi, J., The Columbus poltergeist case. The Skeptical Inquirer *9* (1985) 221–235.
31 Rhine, J. B., A new case of experimeter unreliability. J. Parapsychol. *38* (1974) 215–225; Second report on a case of experimenter fraud. J. Parapsychol. *39* (1975) 306–325.
32 Rinn, J., Searchlight on Psychical Research. Rider, London 1954.
33 Rogo, D. S., J. B. Rhine and the Levy scandal. A Skeptic's Handbook of Parapsychology, pp. 313–326. Ed. P. Kurtz. Prometheus Books, Buffalo, N.Y. 1985.
34 Sagan, C., The Cosmic Connection. Anchor Books, New York 1973.
35 Scott, C., and Haskell, P., 'Normal' explanations of the Soal-Goldney experiments in extrasensory perception. Nature *245* 1973 52–54.
36 Sidgwick, E., Proc. Soc. psych. Res. *23* (1909).
37 Soal, S. G., and Goldney, K. M., Experiments in precognitive telepathy. Proc. Soc. psych. Res. *47* 1947 21–150.
38 Thagard, P. R., Why astrology is a pseudoscience, in: Introductory Readings in the Philosophy of Science, pp. 66–75. Eds E. Klemke, R. Hollinger and A. D. Kline. Prometheus Books, Buffalo, N.Y. 1980.
39 Wegener, A., Die Entstehung der Kontinente. Petermanns geogr Mitt. *58* (1912).

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The detection of fraud and fakery

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Summary. Fraud is often found in science, especially in what is termed, 'fringe science'. There are several reasons why scientists should be aware of the fact that they, too, can be deceived, both by subjects in experiments and by themselves. The will to believe is strong even among 'hard-headed' academics, and is often the factor that causes them to publish results that do not stand up to subsequent examination and/or attempts to replicate. In some cases, scientists would be well advised to consult with such experts as conjurors, when skilled frauds are in a position to mislead them.
Key words. Fraud; fakery; deception; faith healing; conjuring; parapsychology.

Scientists are very easily deceived. They think logically, extrapolate possibilities from evidence presented, assume (with a good probability of being right) certain aspects of the observed data and draw on their past experience in coming to decisions. This is to say that they act very much as all humans do, struggling with sensory input to derive new facts from it. But scientists do this with a certain authority and certainty born of their training and discipline. They are thus excellent candidates for being flimflammed by a clever operator who is aware of the fact that scientists seldom bring the human element into account.

Protons, grains of sand, cannon balls and planets behave themselves. They do the same thing, under the same influence, in essentially the same way each and every time. They are predictable, within definable limits. When they misbehave, the scientist perks up and is compelled to determine just why this has happened. If something new is discovered by these means, the parameters are redefined and we know something more about our universe.

One factor often overlooked is the human factor. I will postulate a simple situation: Let us suppose that a researcher has decided to check the quite accepted fact that mixing two parts of hydrogen with one part of oxygen and passing a spark through the mix will result in the creation of a drop of water accompanied by a minor explosion. The appropriate equipment is assembled, and a run of 10,000 trials scheduled. As expected, the first 700 trials result in explosions and water drops. At that point, a lunch break is called, and all retire from the lab. Upon returning to the experiment, the chief experimenter discovers that upon passing the spark, no explosion results and spectroscopic examination of the gas mixture shows it to be argon!

Is the scientist justified in concluding that occasionally the hydrogen/oxygen mixture will combine to form argon rather than water? Of course not. Why not? Because: 1) It is well-established that elements under these conditions do not transmute; 2) Parsimony dictates another answer; 3) This experiment is very well repeated and has never had this result before, especially in such a short run; and 4) The one startling result was obtained immediately following a break in the experiment during which tampering with the apparatus was possible.

That last condition says it all. A prank on the part of an associate is far more to be expected as an answer than a major breakthrough in alchemy.

In the parascience of parapsychology, a strong belief structure exists that predisposes the parapsychologist to ignore otherwise obvious factors that could provide a simple, non-extraordinary solution to a problem. Indeed, the very fact that a paradox presents itself is enough to fire up a parascientist to the publishing point. This is my First Axiom: In parapsychology, any evidence of a paradox is proof of the profundity of the phenomenon.

My Second Axiom follows swiftly: It is not the quality of the evidence, but the quantity of it, that really counts. This is often expressed in lay language as, 'Twenty thousand astrologers can't be wrong.'

But what qualifies me, a mere amateur, to declare on these weighty matters? Let me explain. I am a conjuror (often mis-called, 'magician') and as such I have a very powerful,