

# SCIENCE and the PARANORMAL

PROBING THE EXISTENCE OF THE  
SUPERNATURAL

---

EDITED BY  
GEORGE O. ABELL and BARRY SINGER

# SCIENCE and the PARANORMAL

## PROBING THE EXISTENCE OF THE SUPERNATURAL

---

EDITED BY  
**GEORGE O. ABELL and BARRY SINGER**

CHARLES SCRIBNER'S SONS • NEW YORK

"Plant Sensitivity and Sensation," by Arthur W. Galston and Clifford L. Slayman, first appeared as "The Not-So-Secret Life of Plants" in *American Scientist* 67 (May 1979), pp. 337-44, and is reprinted here by permission of Arthur Galston.

Some of the material in "Biorhythms," by Tarek Khalil and Charles Kurucz, has appeared in different form in the following articles by the authors: "The Influence of 'Biorhythm' on Accident Occurrence and Performance," *Ergonomics* 20 (1977), pp. 389-98, and "Probability Models for Analyzing the Effects of Biorhythms on Accident Occurrence," *Journal of Safety Research*, vol. 9, pp. 150-58.

"The Subtlest Difference," by Isaac Asimov, copyright © 1977, 1978 by Mercury Press, Inc., from his book *The Road to Infinity*, copyright © 1979 by Isaac Asimov. Reprinted by permission of Doubleday & Company, Inc.; Mercury Press, Inc.; and the author.

"Life After Death," by Ronald K. Siegel, copyright © by Ronald K. Siegel, is reprinted here by permission of the author and has appeared as "Accounting for After-Life Experiences" in *Psychology Today*, January 1981, pp. 65-75.

Some of the material in "Psychic Healing," by William A. Nolen, has appeared in different form in the author's book *Healing: A Doctor in Search of a Miracle*, Random House, 1975, and Crest, 1976.

"An Analysis of Worlds in Collision," by Carl Sagan, is excerpted with permission from Carl Sagan's *Broca's Brain*, Random House, New York, published in 1979, © 1976 by Carl Sagan. This essay first appeared in *Scientists Confront Velikovsky*, Donald Goldsmith, editor, Cornell University Press, 1977.

Parts of "Recasting the Past," by E. C. Krupp, have appeared in "The von Däniken Phenomenon," by E. C. Krupp, in the *Griffith Observer*, April 1974 and July 1977, and are reprinted here with permission.

Some of the material in "UFOs," by Philip J. Klass, has appeared in different form in the author's book *UFO's Explained*, Random House, 1974, and Vintage, 1976.

Copyright © 1981 George Abell and Barry Singer

### Library of Congress Cataloging in Publication Data

Main entry under title:

Science and the paranormal.

Bibliography: p.

Includes index.

1. Psychical research—Addresses, essays, lectures. 2. Occult sciences—Addresses, essays, lectures. 3. Science—Addresses, essays, lectures.  
I. Abell, George Ogden, 1927— II. Singer, Barry.

BF1045.S33S38 133.8'01'5 81-26839

ISBN 0-684-16655-0

This book published simultaneously in the United States of America and in Canada—  
Copyright under the Berne Convention.

All rights reserved. No part of this book may be reproduced in any form without the permission of Charles Scribner's Sons.

3 5 7 9 11 13 15 17 19 F/C 20 18 16 14 12 10 8 6 4 2

Printed in the United States of America.

# Believing the Unbelievable: The Scientific Response

## A FOREWORD

---

PAUL KURTZ

A dispassionate observer of the current scene can only be astonished by the rapid growth of bizarre beliefs in recent years among wide sectors of the public. This involves everything from belief in "psychic" forces—clairvoyance, precognition, telepathy, psychokinesis, psychic surgery, psychic healing, astral projection, levitation, plant ESP, life after life, hauntings, and apparitions—to the widespread conviction that our earth has been visited in the past by ancient astronauts in "chariots of the gods" and is being visited today by extraterrestrial creatures in space vehicles. Added to the collage is the fascination with such science fiction as the "Bermuda Triangle mystery," which is explained by a secret underwater UFO base (or a "black hole" or a "time warp") from which unsuspecting ships and planes are snatched. Included in the upsurge of strange views is a revival of many ancient occult beliefs: demonic possession, reincarnation, astrology, palmistry, fortune telling, monsters of the deep, auras, and pyramid power.

These phenomena are often called "paranormal," especially by their proponents; the term is applied to anomalous data that supposedly transcend the limits of existing science and are due to unknown and

hidden causes. The paranormal world view that seems to be emerging contravenes the model of the universe derived from the physical and behavioral sciences. It is fed by the mass media: books, articles, TV, quasi-documentaries, and movies all herald the new paranormal "frontiers" of knowledge. Countless millions of people are intrigued by the realm: they are convinced that ESP is a proven fact, that there is conclusive evidence for life after life or life before life, that psychic healing can cure physical ailments, that there have been close encounters of the third kind with intelligent beings from outer space.

What should be the response of scientists to the current outbreak of irrational beliefs? Until recently, many scientists have chosen to ignore them, attributing their persistence to gullibility and superstition, hoping that they would eventually dissipate. Yet others are disturbed by their continued growth. Does this portend the end of the Enlightenment and the Age of Science, which began in the sixteenth and seventeenth centuries, they ask? Perhaps it points not to the end of technology but only of the scientific outlook in which knowledge is based upon careful methods of inquiry and verification. Some have assumed that a new Apocalypse of Unreason is about to descend upon us. The symptoms of this, they say, can also be seen in the proliferation of numerous cults and sects that offer salvation, abandon objective standards of truth, and manifest a dread of technology and science. If in earlier periods people looked to science and reason as the great promise of the future, today there is often great fear of science and technology as harmful and destructive. The classical periods of Greek and Roman civilization, in which philosophy and the arts flourished, were fairly brief—and were eventually engulfed by the Dark Ages. Some warn that the same "failure of nerve" may be repeating itself, as future shock and cultural breakdown overtake us. Such doomsday forecasts are probably overly speculative, for there are still millions of educated people who believe in the uses of science and require hard evidence to establish truth claims. Fortunately, there are also a number of scientists who have recognized that they have a responsibility that goes beyond their own specialties: to apply the methods of science to the scrutiny of claims of the paranormal and thus contribute to public information and education.

In 1976, I was instrumental in founding the Committee for the Scientific Investigation of Claims of the Paranormal, whose explicit purpose is the evaluation of paranormal claims. We believe that scientists should not simply reject unorthodox claims out of hand, however fan-



ciful they may appear, but rather should submit them to careful investigation. Although in the present day there is a strong antiscientific and antitechnological mood that recoils from the scientific method of inquiry, there are also many proponents of the paranormal who attempt to co-opt the mantle of science, claiming that their work is supported by science. The term *pseudoscience* has sometimes been applied to many such fields: fields of inquiry that claim to be based upon scientific research, yet lack coherent or consistent theories, have no clearly definable conceptual framework, do not use rigorous methods to test their hypotheses, and make claims of discoveries that are not substantiated by the evidence. This is the case today with biorhythm theory and astrology, for example, as it was with phrenology in the nineteenth century.

Nevertheless, scientists cannot commit the fallacy of a priori negativism—that is, they cannot reject new areas of knowledge antecedent to inquiry. The history of science is full of radical breaks with established theories, however unexpected they were—the Einsteinian modification of classical physics, the germ theory and Simmelweiss's battle with the medical fraternity, the concept of shifting continents, and so forth. On the other hand, not every claim to truth from any source is responsible or deserves an equal hearing. The concepts and hypotheses introduced must be meaningful and must lend themselves to some verifiable tests.

Certain areas of the paranormal have been examined by scientific investigators in the past. This is particularly true of "psychical research." The Society for Psychical Research, for example, founded in 1882 by a number of distinguished scientists and philosophers, was dedicated to the investigation of "spiritual" and "psychic" phenomena. This was superseded by the emergence of parapsychology in the 1920s and 1930s, which marked an effort to use experimental methods to investigate psi phenomena.\* Unfortunately, surrounding these fields are a large number of unproven claims, extrapolated beyond the narrow confines of the laboratory. Many investigators in these fields are biased by an a priori commitment to the belief that a specific phenomenon exists and can only be given a paranormal explanation. Often ranged against them are the uncompromising skeptics who reject the very

\* Psi is defined here as an alleged general psychic ability that manifests itself in precognition, psychokinesis, clairvoyance, telepathy, and other alleged paranormal phenomena.

possibility of phenomena such as ESP, arguing that they contradict the existing principles of science. Unfortunately, both postures are mistaken. Science must always be open to novel departures in thought and receptive to new theories—even though they may overthrow the existing framework. Most of the claims that new paradigm models have been discovered in the paranormal realm have not been substantiated by the evidence. Merely to proclaim a “discovery” does not validate it; there is a difference between a constructive skepticism that is based upon careful inquiry and analysis and suspends belief until it is confirmed experimentally, and one that prejudices a subject matter without inquiry. It is only the former that is defensible and makes a contribution to scientific progress.

Two problems that confront science today are especially serious: First, there has been some confusion in the public mind in distinguishing between science fiction and truth. This is the Age of Science Fiction, where the human imagination outstrips present reality. Isaac Asimov, a contributor to this volume, is a brilliant author of science fiction, yet he is skeptical of the truth of the paranormal. He is well aware that an idea's being plausible or possible does not necessarily make it true. Human creativity can construct ideal worlds, but we should not accept them as true until there has been independent confirmation.

Second, there has been an evident breakdown in the consensus concerning the standards or criteria for judging truth claims. Some of this may have its source in recent philosophy of science, where positivistic criteria of scientific validation and confirmation have been questioned. Some of it may also emanate from the new frontiers of physics and astronomy, often difficult for laymen to understand or translate into common-sense terms. Unfortunately, many people have apparently concluded—and this is especially true of numerous undergraduates today—that there are no standards of knowledge, that all knowledge is subjective, and that any one belief is as true as the next. Subjectivism contests the epistemological foundations of science: the controlled uses of objective methods of inquiry, the criteria of logic, and the use of experimental tests to verify hypotheses. In the last analysis, it is *evidence* that can decide the truth of one claim rather than another—and this evidence must be available to scrutiny by independent observers and capable of being replicated under test conditions in any laboratory in the world. Regrettably, most of what goes under the name of the

paranormal is pseudoscience, since it does not satisfy these rigorous standards.

The contributors to this volume are eminently qualified to deal with the many controversial claims made about the paranormal. They have taken the claims seriously; they have not rejected them without examination, but have devoted their energy and talents to investigating their merits. For example, Dr. William Nolen has scrutinized psychic healing first-hand, even visiting the Philippines to be "operated" upon by a "psychic surgeon." Carl Sagan has devoted a good deal of his attention as an astronomer to the theories of Immanuel Velikovsky, and he helped to initiate and plan a special controversial session of the American Association for the Advancement of Science to discuss his theories. Martin Gardner has spent years examining the "fads and fallacies" of the day, with special focus on parapsychology, as have Ray Hyman and James Randi. George Abell, a noted astronomer, is an expert on astrology and has actually sought out, worked with, and debated astrologers about their claims. Philip Klass, one of the leading authorities in UFO research, has even gone into the field to examine alleged sightings. Larry Kusche has painstakingly analyzed the data concerning the Bermuda Triangle. Other contributors to this volume are similarly qualified.

Unfortunately, all too many recent books have extolled the paranormal: there have been numerous best sellers on astrology, biorhythms, the Bermuda Triangle, ghosts, the superpsychics, and other such topics. Here at long last is a different kind of book, one that critically and dispassionately analyzes such claims—and finds them wanting. It is long overdue for the public to have a more balanced appraisal of the paranormal.



paranormal is pseudoscience, since it does not satisfy these rigorous standards.

The contributors to this volume are eminently qualified to deal with the many controversial claims made about the paranormal. They have taken the claims seriously; they have not rejected them without examination, but have devoted their energy and talents to investigating their merits. For example, Dr. William Nolen has scrutinized psychic healings first-hand, even "operated" upon by a "psychic surgeon," "Caspar" as an astronomer to the Russian "Veltkovsky," and he helped to initiate and plan the first symposium of the American Association for the Scientific Study of the Paranormal. He has also written the book "The Paranormal: A History of the Field and the Field's History." Philip Klass, one of the leading debated astrologers about their claims, Philip Klass, one of the leading authorities in UFO research, has even gone into the field to examine alleged sightings. Larry Kusche has painstakingly analyzed the data concerning the Bermuda Triangle. Other contributors to this volume are similarly qualified.

Unfortunately, all too many recent books have extolled the paranormal. There have been numerous best sellers on astrology, biorhythms, the Bermuda Triangle, ghosts, the supernatural, and other such topics. Here at long last is a different kind of book, one that critically and dispassionately analyzes such claims—and finds them wanting. It is a long overdue for the public to have a more balanced appraisal of the paranormal.

# CONTENTS

**Believing the Unbelievable:  
The Scientific Response—A Foreword** vii

PAUL KURTZ

**Introduction** 1

GEORGE O. ABELL

BARRY SINGER

**1. To Believe or Not to Believe** 7

BARRY SINGER

**2. Monsters** 24

DANIEL COHEN

**3. Plant Sensitivity and Sensation** 40

ARTHUR W. GALSTON

CLIFFORD L. SLAYMAN

**4. Parapsychology and Quantum Mechanics** 56

MARTIN GARDNER

**5. Astrology** 70

GEORGE O. ABELL

**6. Moon Madness** 95

GEORGE O. ABELL

**7. Biorhythms** 105

TAREK KHALIL

CHARLES KURUCZ

**8. Scientists and Psychics** 119

RAY HYMAN

**9. On Double Standards** 142

BARRY SINGER

10. <b>The Subtlest Difference</b>	149
ISAAC ASIMOV	
11. <b>Life After Death</b>	159
RONALD K. SIEGEL	
12. <b>Psychic Healing</b>	185
WILLIAM A. NOLEN	
13. <b>Kirlian Photography</b>	196
BARRY SINGER	
14. <b>Science and the Chimera</b>	209
JAMES RANDI	
15. <b>An Analysis of Worlds in Collision</b>	223
CARL SAGAN	
16. <b>Recasting the Past: Powerful Pyramids, Lost Continents, and Ancient Astronauts</b>	253
E. C. KRUPP	
17. <b>The Bermuda Triangle</b>	296
LARRY KUSCHE	
18. <b>UFOs</b>	310
PHILIP J. KLAS	
19. <b>Intelligent Life in the Universe</b>	329
FRANK D. DRAKE	
20. <b>On the Causes of Wonderful Things: A Perspective</b>	349
PHILIP MORRISON	
<b>Notes and Bibliographies</b>	363
<b>Additional Readings</b>	392
<b>The Authors</b>	395
<b>Index</b>	407

## Introduction

GEORGE O. ABELL

BARRY SINGER

Science was relatively simple in Galileo's day. At that time a well-educated person had a good chance of acquainting himself with much of what was known about natural philosophy—or science, as we now call it. There was no quantum mechanics, no nuclear physics, no biomedicine, no immunology; mathematics was pretty well limited to algebra and geometry, and physics consisted of some rather simple rules about the way bodies in motion seem to behave.

It is superfluous to say that science exploded in the last century. As the world population increased manyfold so did the number of scientists, each building on the advances of the previous generations of scientists. As the number of scientists and disciplines and subdisciplines has increased, the latter becoming ever more complex, science has become increasingly remote from the lay person, making it more and more difficult to learn what is known about even a limited subject. As an example, consider the *Astrophysical Journal*—just one of several international sources dealing with modern astronomy. All the issues of the *Journal* published in the fifty-five years from its founding in 1895 until 1950 occupy fourteen feet of shelf space; those published in the

eleven years from 1968 to 1978 fill seventeen feet of shelf space! The frontier of knowledge in astronomy has become so specialized that astronomers in one field often cannot understand the papers in another; to do so would require months, often years, of study. Each subarea of each discipline has developed its own jargon, and even scientists in the same general field often cannot communicate with those in different subdisciplines.

Those scientists who work at the frontier of knowledge in a particular subdiscipline often disagree with each other, sometimes vehemently. Generally, though, as more information becomes available on a subject, the investigators begin to find out which ideas are right and which wrong by the success of their predictions, and gradually the scientists in that discipline reach a consensus. Then the frontier moves on to new areas, where new disagreements emerge. Meanwhile, scientists in other subdisciplines, even of the same general field, may frequently misunderstand hypotheses recently accepted by those in a different subdiscipline. For example, astronomers who are expert in the study of the structure of stars may have quite a wrong idea about the confidence with which their colleagues estimate the distance to a particular cluster of galaxies.

If even scientists within the same discipline are often in the dark about an aspect of their discipline not in their own field of specialization, how can the public hope to interpret strange-sounding claims that purport to apply at the frontier? The very language spoken by scientific experts is alien to many of their colleagues; how much more foreign it must sound to those outside science altogether.

Yet many of those fields at the very frontier of science are of tremendous interest to all of us. What is the age of the universe? What started it expanding? Will it expand forever? What defines consciousness in a living organism? How does the consciousness of animals differ from that of plants? What is intelligence? What is the fundamental difference between living and nonliving organisms? How did life come to be in the first place?

Unfortunately, the news media cannot always be trusted to provide reliable information on these issues. In a free society there is quite rightly no requirement that everything published or presented in the media be true; unfortunately, a great deal of it is balderdash indeed. Bookstores contain many times as many volumes on pseudoscience as they do on science; so do the best-seller lists. Television programs and motion pictures with the format of documentaries carry demonstrably

false accounts of ancient astronauts, psychic healing, strange monsters, and children who allegedly bend metal with their minds. The public's good faith and willingness to believe the media are mercilessly exploited, and fortunes are being made in the process.

How then can nonscientists inform themselves about a particular area of science? The best strategy for obtaining an objective evaluation is to do what scientists themselves do: ask those who best understand the subject. Thus, scientific journals regularly commission review papers on particular subjects to acquaint those in other subdisciplines with knowledge at the frontier. Scientific meetings and symposia are regularly scheduled to share and evaluate new data and new ideas. Those who are most expert in the subject—who are closest to the field—are the ones selected to prepare these summaries and reviews.

Of course the experts are sometimes wrong, even when there seems to be a consensus among them. It is not unusual for one or two dissidents to argue vigorously and alone, and once in a while they will turn out to be correct. Galileo is a classic example. In his time, the traditional view was that the earth was immobile and at the center of the universe, but he (and a few scientific colleagues, like Kepler) argued that the earth rotates and revolves around the sun. But it is rare that a dissident is right, and even then the dissident is almost always himself an expert in the field. Galileo was not an outsider; his learning and experience placed him at the very forefront of the field he was investigating.

Even though erroneous scientific ideas may be held for a time, in the long run they will be rejected because science is a self-correcting discipline. It is guided by rigorous rules, and constantly and continually rechecks its hypotheses; each is taken seriously only to the extent that it successfully predicts the results of new research. Where mistakes are made, or when the consensus of those in a particular discipline turns out to be wrong, the error is usually found out before long and the mistakes put right.

Meanwhile, far behind the frontier is a well-trodden region which has become very well understood indeed. Main ideas in that region are very unlikely to be proven wrong. The system of Newtonian mechanics, for example, works extremely well for the motions of objects in the solar system (consider the brilliant success of the Voyager mission to Jupiter!), as well as for material objects on the earth. Indeed, Newtonian mechanics is the basis of much of our modern technology. It is true that it is not absolutely and finally correct; both quantum



mechanics and relativity theory extend our understanding into realms where Newtonian theory does not apply. But quantum mechanics and relativity do not show that the Newtonian system is wrong in the regions where it has been well tested. In fact, when we deal with objects that are not at the submicroscopic level, or moving at speeds near that of light, quantum mechanics and relativity theory predict exactly what Newtonian theory does.

The subjects discussed in this book are those in which dramatic claims and speculations, usually made by nonscientists, have aroused considerable public interest. The claimants typically assert that they have made discoveries beyond or in contradiction to traditional science; hence the term *paranormal*, where the Greek prefix *para* means "beyond." The term *pseudoscience* is often used by scientists to describe such topics and claims. The reason scientists have rejected most of them is not that their practitioners do not pay dues in the scientific "establishment," but because the claims cannot withstand rigorous scrutiny and are not consistent with what has been well documented and what is well understood.

Where there is a conflict between scientists and those outside of science, we have already suggested that it would be a reasonable strategy to give more credence to the experts—the scientists—than to those outside the relevant discipline. Unfortunately, however, it is often difficult for the public to know which scientists are most qualified to speak for that discipline. Moreover, while many people respect the opinions of scientists in most areas, they do not perceive scientists to be as authoritative when they criticize the area of the paranormal, perhaps because they suspect that scientists are uninformed or biased about paranormal subjects. This book is designed to deal with these problems.

First, all the authors in the book are recognized experts in the fields they are writing on, eminent scholars who are widely acknowledged to be scientists or science writers (frequently both) of exceptional merit and integrity.

Second, and most important, our authors have not just asked us to take their word for their positions, but have tried to explain the mainstream scientific viewpoint on each paranormal topic thoroughly and simply. They do not merely debunk, but look at each topic through the lens of science, and by minimizing technical terms and simplifying theories they invite us to share that microscope with them, to follow the details of their reasoning. We believe that our readers will

enjoy the process, and come to understand and agree with the systematic logic of the conclusions reached.

For we are less interested in debunking than in presenting a sound scientific perspective. In fact, the topics of this book span the range of degrees of credibility. Some authors speculate on subjects at the scientific frontier where not a great deal is known but where the paranormal view does not at this time seem plausible. Others deal with subject matter in well-trodden territory where the pseudoscientific view is clearly incompatible with what is well understood. Still other speculations discussed here, however, might very well prove to be correct: there is a slight chance, for example, that there does exist a large species of animal in the Himalayas or in Loch Ness that has not been classified by zoologists. And, as Frank Drake shows, many scientists today consider the chances that intelligent life exists elsewhere in the universe to be very high indeed.

Third, not only have our authors attempted to be open, clear, and detailed in their reasoning, but the charge of scientific prejudice or double standards with respect to the paranormal is explicitly addressed in the chapter by Hyman and the essay on double standards by Singer that follows it.

The authors of this book have taken time from busy professional lives to prepare careful analyses because they care deeply what the public thinks, and how it regards science. The human race is facing many crises: overpopulation, pollution of the environment, exploitation of resources and their eventual exhaustion, the growing stockpile of nuclear weapons, racial intolerance and economic deprivation, and a host of other problems, all of which threaten our very existence as a species. If we are to survive even over the next few decades, let alone for hundreds of thousands of years, we must somehow face the problems that confront our society with all of the intellectual capacity and rationality at our disposal. We are lost if we pin our hopes instead on pseudoscientific speculation or on the murky occult beliefs of past millennia.

