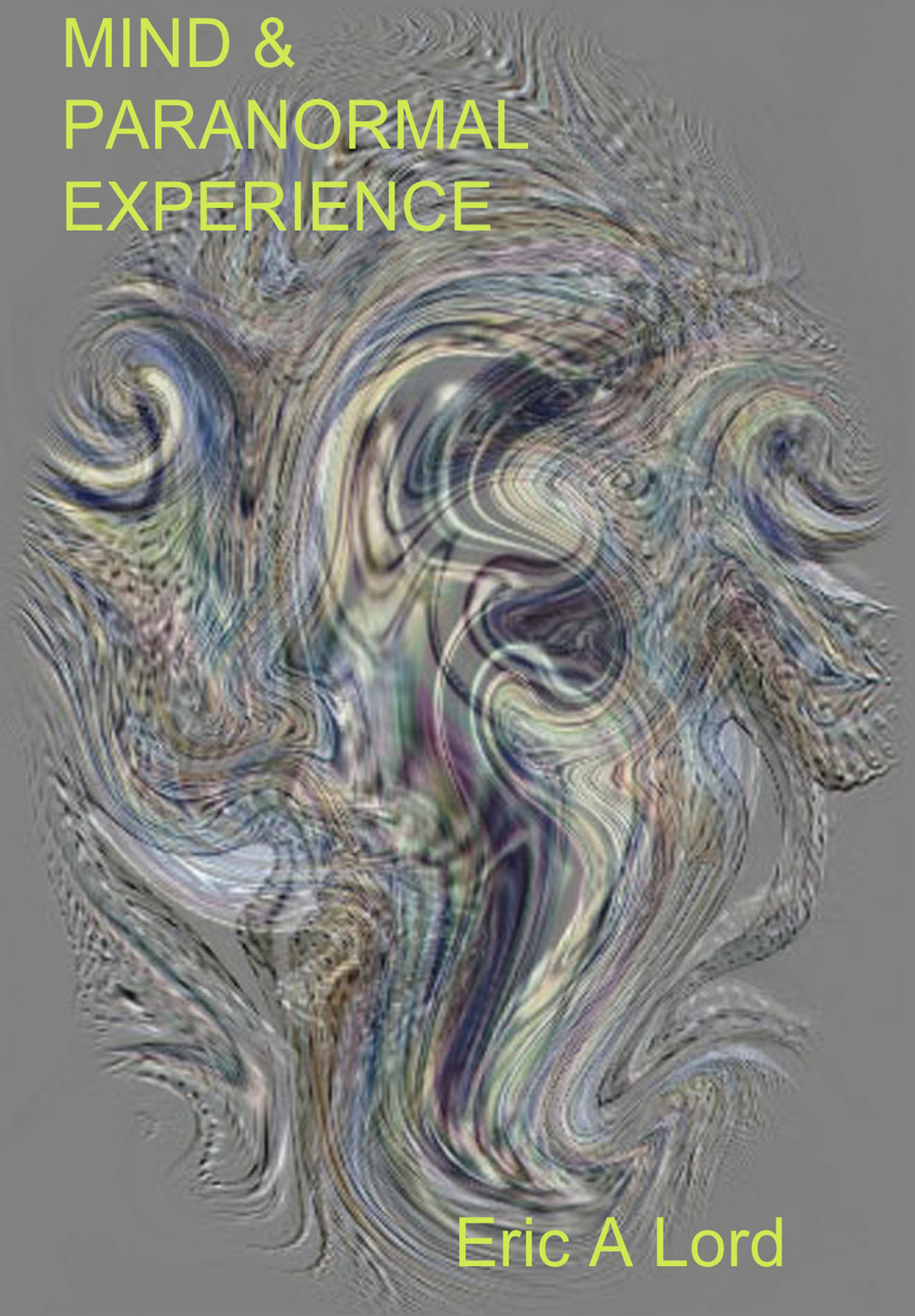


The twentieth century has brought astonishing advances in scientific knowledge. A consequence has been a growing conviction among many that science now has almost all the answers to 'the question of life, the universe and everything'. This is totally at variance with any belief in the reality of 'paranormal' or 'occult' phenomena. The easy option is to debunk - to assert that anything that doesn't fit in to the scheme discovered by science is necessarily some kind of delusion. Yet, when one delves into the evidence for the reality of paranormal events - evidence for telepathy, for reincarnation, for out-of-the-body experiences, for the visionary experiences of saints and mystics - the list is extensive - it turns out to be not at all trivial. It is showing us that something utterly vital is missing from the current scientific view of reality. Understanding what paranormal experience really is and how it 'fits in' to the scientific picture of reality is of central importance to any reasonable answer to the question: who are we, and *what is* this 'reality' we find ourselves in? Perhaps the scientific view of the nature of this reality presents only a facet of a reality richer and stranger than we suppose. Perhaps - to paraphrase a remark of J B S Haldane - it's stranger than we *can* suppose.

SCIENCE, MIND & PARANORMAL EXPERIENCE Eric A Lord

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Eric A Lord

SCIENCE,
MIND
and
PARANORMAL EXPERIENCE

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MIND
and
PARANORMAL
EXPERIENCE**

Eric A. Lord

Other Books by Eric Lord:

Tensors, Relativity & Cosmology. Tata McGraw-Hill, Delhi 1976.

E. A. Lord & C.B.Wilson. The Mathematical Description of Shape and Form. Ellis Horwood 1984.

E. A. Lord, A. L. Mackay & S. Ranganathan. New Geometries for New Materials. Cambridge University Press 2006.

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Truth is tough. It will not break, like a bubble, at a touch; nay, you may kick it about all day like a football, and it will be round and full at evening.

— *Oliver Wendell Holmes*

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PREFACE

I have never had a premonition or (as far as I know) seen a ghost. I have (as far as I know) no 'psychic' abilities. I have, though, always been drawn to books about such things. I find them entertaining, in the same way that my other interests are entertaining; that is, stimulating to the imagination. Commitment to a belief, one way or the other, has never seemed necessary to me. The urge to think about this topic — the so-called 'occult', 'supernatural' or 'paranormal' — more intensively, and to try to understand more clearly what (if anything) it all amounts to, was precipitated by numerous discussions and arguments with my close friend and scientific colleague Prashant Goswami; we had discovered a common interest. Without the stimulus of our discussions I doubt that I would ever have written a book of this kind.

In the beginning, I had not fully reckoned with the strength of conviction behind the belief, held by many, that paranormal events are simply impossible, nor with the persuasiveness of some of the arguments put forward by those who subscribe to this belief. I have at times been almost persuaded by them. My own feeling now is that the arguments of materialists, reductionists and self-styled 'sceptics' are not an adequate response to the facts of human experience. These arguments are founded on a particular and narrow view of the nature of reality that is not, as is claimed, either more 'rational' than other views or especially supported by the present state of scientific knowledge. That is what this book is about.

Acknowledgements

I thank Prashant, without whom this book would not have arisen, and whose thoughts on the subject have influenced mine considerably. Even our disagreements were a valuable stimulus to further thinking. My wife Janet was very tolerant during the long periods when I was engrossed in this work; I am especially grateful for the help she gave me whenever I found difficulty in expressing a point clearly and elegantly, and for her proof-reading of the typescript. I thank also Prof. P.L. Sachdev for his interest and encouragement and for conversations about the literature of meditation and mystical experience. I prepared the manuscript on his word processor, which Nalini Shreeshylam and N. Ravishankar taught me how to use. Many thanks

especially to M. Renugopal who rapidly and accurately typed the last three chapters for me, to Prof. S. Ramaseshan who provided me with one of the cases presented in chapter 11, to Ingrid K. Sievers for hunting down an obscure reference and to the Society for Psychical Research for providing me with up-to-date information on the status of the Soal-Shackleton data. This book is rich in quotations. I am, of course, indebted to all those authors who have, over the years, contributed to my reading pleasure, influenced my thoughts on these topics, and from whose works I quote.

1 INTRODUCTION

Gullibility and Scepticism

There is a story¹ of two medical students who, many years ago, took lodgings in a small town and put about a rumour that they were famous doctors who could bring the dead back to life — they had certificates to prove it. They spent many hours in the cemetery, silently observing a few of the graves. As the weeks passed, the townsfolk became more and more anxious. At last, the two strangers began to get letters — from a widow who had remarried, from a young man who had inherited his uncle's estate, and others. All requested that the dead should be left in peace, and all enclosed sums of money. Finally, the mayor of the town offered the strangers a handsome sum on condition that they leave the town and conduct their experiment elsewhere, and gave them a certificate endorsing their claim that they could restore the dead to life. The students' experiment had succeeded again! "Nowadays, people are not so gullible — at least, that's what we believe..."

In some individuals, the need to believe in a rational and well-understood world asserts itself so strongly, that they reject outright as superstitious nonsense any suggestion that seems to conflict with that belief. Others find this rationalist world-view cold and inhuman and have an equally strong need for the mysterious and the miraculous. Though these two diametrically opposed psychological types are extremes, and most of us fall somewhere between, they are remarkably common. Correspondingly, two diametrically opposed phenomena have become increasingly prevalent in recent years. On the one hand, we see a growing confidence (perhaps it would be fair to say overconfidence) in the explanatory power of science. Rapid and spectacular developments in scientific understanding of the mechanisms governing the physical world have produced a feeling in many quarters that the puzzle presented by the universe we are a part of is now, at least in broad outline, nearly solved, and that we have a fairly clear idea of what kinds of things are possible and what are not. On the other hand, we see a growth of interest in the 'occult' and the 'supernatural'. The latter tendency is abundantly evident in the plethora of books purveying absurd pseudo-sciences — fanciful fictions masquerading as fact — that mislead the gullible and the scientifically ill-informed into crazy beliefs about the nature of reality.²

This book is the result of a search for a saner and more balanced understanding of so-called paranormal phenomena — those human experiences that seem to be in conflict with present knowledge of the physical world and the way it operates. I am not referring here to bizarre notions and theories, but to bizarre experiences (or, rather, experiences that seem bizarre in the light of current knowledge). The search is a search for *understanding*, not for simplistic debunking ‘explanations’ that force alleged paranormal events into the strait-jacket of currently-held scientific beliefs. The debunking mentality is, it seems to me, naive, and no less irrational than gullibility.

Rawcliffe’s *Psychology of the Occult*³ is a classic example of the extreme skeptical viewpoint. He demonstrates that none of the evidence for anomalous so-called ‘paranormal’ or ‘supernatural’ events is absolutely impeccable. (As if evidence for *anything* is ever absolutely impeccable.) Assuming ‘rational’ to be synonymous with ‘lying within the boundaries of present scientific knowledge’, he claims that one can always find ‘rational’ explanations and proceeds to construct elaborate debunking or ‘explaining away’ arguments to fit a large number of cases. As a reminder of the ever-present danger of jumping to premature conclusions, the work is important in drawing attention to some of the pitfalls of paranormal investigation and experiment. But it is also a beautiful revelation of the psychology of the sort of mind that cannot and will not conceive that the world might *in fact* contain mysteries that science is not yet in a position to understand. Rawcliffe makes it abundantly clear that he has no doubts whatever about *his* belief that all belief in the paranormal (which he likes to call ‘the supernatural’) is nonsense — an archaic remnant of pre-scientific superstition — and that all apparent evidence for mysteries lying outside the framework of present knowledge *must* arise from delusion. It is amusing that Julian Huxley, in his foreword to the book, while applauding it for its attack on gullibility, shows himself unable to accept Rawcliffe’s extreme viewpoint:

But I must confess that I cannot follow him in stigmatizing studies in telepathy, clairvoyance, etc. as ‘occult research’ unfit to be admitted into our universities. Hypnotism was for long regarded as mere quackery and if modern psychical research has some of its origins in superstition, it is also inspired by the desire for new knowledge.

We simply do not yet know what the basic relation is between mental activity and physical brain activity. It is extremely important to find out whether and under what conditions

mental activity may be detached from the physical; we can be sure that many possibilities of mind or mental activity are still unexplored.

— Julian Huxley ⁴

Many sciences attract a lunatic fringe of cranks and crackpots. An impediment that the serious study of the paranormal has to contend with is that, throughout its history, the topic has come in for more than its fair share of wild and fanciful notions, fraud and hoax. An unfortunate effect of this is the widespread feeling that the investigation of paranormal phenomena is somehow disreputable — unscientific. Such a view is lacking in elementary discrimination; there is all the difference in the world between a crank and an investigator sincerely attempting to arrive at an understanding of an elusive and mysterious phenomenon.

An organization calling itself the ‘Committee for the Scientific Investigation of Claims of the Paranormal’ (CSICOP) was set up in 1976 by Paul Kurz, a professor of philosophy; its worthy aim was to combat the rising tide of nonsensical pseudosciences. The list of its committee members is impressive — it contains the names of dozens of highly accomplished scientists. Here are just a few: (the late) Isaac Asimov (prolific science and science-fiction writer); Sir Francis Crick (joint Nobel prizewinner, with James Watson, for the elucidation of the structure of DNA); Martin Gardner (author; particularly noteworthy and relevant to our topic are his two classic works on cranks and pseudosciences, *Fads and Fallacies* and *Science: Good, Bad and Bogus*); Murray Gell-Mann (leading elementary-particle physicist and Nobel prizewinner); Douglas A. Hofstadter (professor of cognitive science and a leader in the artificial intelligence debate); Philip J. Klass (science writer and engineer; arch-debunker of ‘UFO mythology’); James Randi (conjurer and self-proclaimed enemy of ‘the paranormal’); (the late) B. F. Skinner (leading behavioural psychologist). [Those I have omitted should not feel offended — I simply picked out the names most familiar to me.] CSICOP publishes a magazine, the *Skeptical Inquirer*. Its crusade against gullibility is admirable and its articles, on the whole, scholarly and well-researched. But the debunking mentality is very much in evidence. Plausible sceptical examination of experiments in parapsychology are presented side by side with ridicule of corny things like pyramid power, palmistry, numerology and creationism. There is a danger of throwing out the baby with the bathwater in the presupposition that all ‘claims’ of mysterious or inexplicable events are necessarily nonsense, and in the denigration of

open-minded investigations of mysterious phenomena as ‘fringe science’.

Two fascinating accounts of the history of the *Skeptical Inquirer* and a rival publication, the *Zetetic Scholar*, one by Martin Gardner⁵ and one by Douglas Hofstadter⁶ are recommended to the reader. Hofstadter’s article is a thought-provoking discussion of the problematic nature of the criteria human beings adopt for judging evidence. In a postscript to his essay, Hofstadter quotes at length from his correspondence with Marcello Truzzi, editor of the *Zetetic Scholar*, concerning Hofstadter’s criticism that the magazine was too open-minded and sympathetic toward cranky ideas. The following quotation from this correspondence illustrates nicely, I think, what investigators of the paranormal are up against:

I feel that ESP and so on are incompatible with science for *very fundamental reasons*. In other words, I feel that they are so unlikely to be the case that people who spend their time investigating them really do not understand science well. Instead of welcoming them into scientific organizations, I would like to see them kicked out.

—Douglas Hofstadter⁷

In a sense, this whole book is a reply to the attitude this unequivocal assertion encapsulates. Hofstadter’s ‘fundamental reasons’, and reasons for doubting that they *are* fundamental, will become clear as we proceed. For the present, I wish only to counter it with another quotation:

My feeling is that the process by which we decide what is valid and what is true is an art; and that it relies as deeply on a sense of beauty and simplicity as it does on rock solid principles of logic and reasoning or anything that can be rigorously formalized.

—Douglas Hofstadter⁸

The criteria whereby we arrive at the degree of credence we give to things we are told, or things we read about, are quite elusive. I am not aware that any attempt has been made to study them, although they are a crucial ingredient of the scientific method. They are rarely, if ever, completely rational; they are intuitive assessments arising out of our personal mental models of reality — models which themselves have been built up from just such intuitive assessments. In this respect,

human beings differ greatly from each other. When confronted with alleged facts, or with new ideas of a controversial nature — be they in the form of newspaper reports, religious doctrines, scientific findings, hypotheses and theories, or philosophical world-views — there is a gamut of positions that people adopt, from stubborn cynicism (outright rejection) to naive gullibility (uncritical belief). It seems to me that an important component of ‘the art of deciding what is valid and what is true’ is the art of *reserving* judgment — of resisting the temptation to jump to conclusions based on unexamined *a priori* convictions. This in turn calls for an ability to take on new ideas in a spirit of ‘what if’ and to explore them heuristically without swearing allegiance to any fixed position. It calls for a willing suspension of disbelief as well as a suspension of belief. Scepticism is required, but we also need to be sceptical of scepticism. Belief is a state of mind. ‘The world is everything that is the case’: its truths are wholly indifferent to our belief and unbelief.

The Evidence for the Paranormal

There exists an abundance of accumulated data that never gains admittance to the citadel of Scientific Knowledge. It is vast; it continues to grow. It knocks at the gate and is turned away.

The data I am referring to are the reports that testify to the fact that human experiences are sometimes exceedingly strange, in ways that give reasonable grounds for doubting the completeness of the framework that science has erected for understanding the world. In spite of spectacular success in acquiring knowledge about the world, and rendering that knowledge comprehensible, scientific methods and scientific thinking have failed to come to terms with an enormous body of data that has arisen from the way human minds experience the world. The variety of conflicting opinions and beliefs that this conflict gives rise to constitutes an interesting phenomenon in its own right. It seems to me that heated debate for and against ‘belief’ in, for example, telepathy, clairvoyance or precognition is a smoke-screen serving only to obscure the real issue. It is an indication that the wrong kind of questions are being asked. One of the important lessons of science is that nature reveals her secrets only to those who ask the right kind of questions, in the right kind of way.

One meets with a wide range of responses to the idea of ‘the paranormal’. There are ‘down to earth’ people who simply ‘don’t believe all that nonsense’, but who in fact have never taken an interest in the topic and do not wish to. There are the gullible, who are willing

and able to believe practically anything. More interesting are those who have regarded the topic of paranormal experience as a matter for serious investigation, and who are disturbed by the problems encountered in trying to understand what it amounts to. Approaches to these problems are rarely if ever free from bias arising from preconceptions. Perhaps that is inevitable; but freedom from preconceptions is, surely, an ideal to be aimed at in the investigation of so difficult a topic. The 'sceptical' view in its most extreme form stems from the conviction that *all* reports of paranormal experience are artifacts of the vagaries of human thought, belief, observation and imagination, to be understood in terms of conventional psychological explanation: hallucination, delusion, misperception, faulty recall, dishonest reporting, deliberate deception, and so on. The view is satisfying to those who hold it because it avoids the uncomfortable prospect of having to reassess and revise firmly-held intuitive convictions about the way the world works. But the empirical basis for the view is insecure. It is based on a *belief* that 'things like ESP' are 'contrary to reason' or 'in conflict with science'. Since it is the foundations of this belief that are called into question by the evidence for ESP, the idea that the evidence can be demolished by opposing it with the belief is illusory. Only the data of observation, carefully and impartially assessed, can tell us what kind of events can occur — can tell us what is and what is not contrary to reason or in conflict with 'science'.

There are two major categories of data to be examined. In the first place, we have the laboratory experiments in parapsychology in which subjects are tested for 'paranormal abilities'. Typically, the results seem to suggest the existence of rather weak phenomena that operate on a 'hit or miss' basis; the evidence is cumulative statistical evidence. Those who are convinced that paranormal events *cannot* occur — 'because they are impossible' — regard any such experiment as conveniently disposed of if there is any possibility at all of a 'rational' explanation. Since deliberate fraud is included — as a last resort — among rational explanations, their position sometimes seems unassailable. But accusations of fraud, in the absence of any evidence to support them, advanced simply because one is unable to accept that something is occurring for which we have no explanation, is tantamount to a refusal to accept *any* experiment as evidence for the paranormal. This *persistent* refusal to accept human testimony amounts to a denial of the possibility of science.

In the second place, we have reports of spontaneous paranormal events; strange experiences that take place in real-life situations —

paranormal events in their ‘natural habitat’. If we were to give credence to even a small proportion of the many thousands of such reports, we would have to conclude that telepathy, clairvoyance and precognition are fairly common features of human life and that events of an even more bizarre nature are not all that uncommon. The total rejection of all such reports, without even examining them, would be quite irrational. *The reports exist* — that fact at least is undeniable. It is not a trivial fact; it is a consequence of the way the human mind consciously experiences the world. The data are worthy of study in their own right. When approached with an unbiased mind free of prejudice and prior conviction about what they might imply, persistent patterns emerge — there is a consistency to the data — and the haunting question of what it all signifies looms large.

At this point, the hard-line sceptics step in and, standing on the firm ground of their unshakable convictions, turn the discussion to the quality of the evidence. They point to those experiments in parapsychology where the controls have been less than ideal, or obviously inadequate, and rest their case. Or they dismiss the whole field of spontaneous paranormal experience by reminding us of the extent to which the human mind is capable of deluding itself when making observations or recalling events, and how it tends to jump to conclusions when assessing evidence. They are fond of words like ‘anecdotal’ and ‘alleged’ when they discuss reports of paranormal experience, thus revealing a cynical attitude towards all such reports — forgetting that much of the evidence accepted in courts of law is ‘anecdotal’ in the sense that it is based on the recollection of events by human observers. It is true that the human mind is not an ideal instrument for recording and reporting events: all that we can know about the nature of reality comes to us processed by human perceptual systems; we are dependent on those systems totally and they impose limitations on human knowledge to an extent that is not often acknowledged. In particular, perception is influenced to a large extent by expectation, prior experience and belief.

In their desire for certitude, human beings have a tendency to be misled by their preconceptions. This tendency is widespread and insidious. It arises in all circumstances where human beings are required to assess evidence or make judgements. It impedes progress in the sciences. It is present in sceptical thinking no less than in gullibility.

Explanations involving faulty observation, faulty recall, exaggerated reporting, fraud, hoax, etc. have sometimes turned out, on further investigation, to be the correct explanation of an alleged paranormal occurrence. The lesson here is that we have to tread warily

when investigating this area of human experience. A healthily sceptical attitude is an essential component of any such investigation. But true scepticism is very different from stubborn refusal to consider evidence simply because it conflicts with, or seems to conflict with, what we already know — or think we know:

The skeptick doth neither affirm, neither denie any position;
but doubteth of it.

— *Sir Walter Raleigh*⁹

Evidence for the paranormal has an elusive quality that makes it very different from the kind of data that science normally deals with, and can cope with. Nature is not obliged to comply with our demands for data of a particular kind. In particular, whenever people report the occurrence of unexpected experiences of an inexplicable nature, the evidence is *of course* ‘anecdotal’ — what else *could* it be? If we wish to understand Nature in all her moods, we have to do the best we can with the data she supplies.

The evidence exists; an embarrassingly large amount of evidence exists. The interesting question is not whether there *is* evidence. The interesting question is: *evidence for what?* Evidence that human beings are silly? Yes, some of the evidence does reveal that; but that is already well-known and not particularly noteworthy. Evidence that there is much that remains mysterious and unexplored about the relationship between mind and the world it apprehends? **Certainly.**

The Scientific Quest

The methodologies and the extensive body of knowledge that constitutes what we call ‘science’ have developed out of the human need to understand and to gain some measure of control over the world in which we find ourselves. Questions concerning the ‘how’ and ‘why’ of natural phenomena are the foundations on which science has been built.

Science arises whenever regularity — orderly behaviour and orderly structure — can be observed in nature. Questions about behaviour and structure are answered by the collection of data, the classification and systematisation of observations, the discernment of patterns and generalities that can be summarised and encapsulated in ‘laws of nature’. This is the earliest phase of any developing science. But the human spirit of enquiry remains unfulfilled by this kind of descriptive knowledge. There is a natural spirit of curiosity in the

higher animals that in many human beings asserts itself as an impatience with superficial knowledge, a need to probe deeper and to gain a better understanding of why observed phenomena are the way they are, an impulse to explore when faced with the mysterious. This is the scientific temperament.

In humans and other animals learning about the world is a continual exploratory process of hypothesis and the testing of hypotheses. In this way, an 'internal model' of the world is built up — a pattern of expectations derived from past experience. Incongruities are percepts that don't fit the pattern. The mind responds in a variety of ways. The most primitive response is anxiety or fear. For example, when a baby first sees the reflection of its mother in a mirror, it may show bafflement — even fear. *Two mothers!* For the baby, this is a 'paranormal event'. The anxiety response disappears when the baby has become accustomed to the mirror phenomenon — when the experience has become integrated into the pattern of expectations. This illustrates the way an incongruous percept or an incongruous concept ceases to be disquieting after it has occurred repeatedly and thus become *familiar*; it is then consistent with past experience.

... what does the people really understand by knowledge? What does it want when it wants 'knowledge'? Nothing more than this: something strange shall be traced back to something *familiar*. And we philosophers — have we really understood anything *more* by knowledge? The familiar, that is to say: that to which we are accustomed... Is our need to know not precisely this — need for the familiar, the will to discover among all that is strange, unaccustomed, questionable, something which no longer disturbs us?

— Nietzsche¹⁰

In infancy the internal model is still fairly fluid and adapts itself readily to unfamiliar experience. In many human adults it becomes so rigid that incongruous percepts, or incongruous concepts, can only be dealt with by setting up mental barriers against them. We then have the stubborn incredulity that masquerades as 'rationality' or 'scepticism'. Another response to incongruities is *curiosity* — the urge to investigate, the need to find out more. Curiosity is particularly strong in our close relatives, the anthropoid apes. In some humans it is developed to a high level. It has given rise to the pursuit of scientific knowledge.

It is only in the last four hundred years or so that rational thought has been combined with systematic and rigorous experimentation to

provide a means of acquiring secure knowledge. The combination has been astonishingly successful. The practical applications of science — technology — now unfold with bewildering rapidity. The gadgetry of the late twentieth century would appear, to the scientists of earlier ages, indistinguishable from magic. The increasing misapplication of technology by businessmen and politicians has brought science itself into disrepute. Yet the source of the scientific quest is an irrepressible need lying deep in the human psyche — the spirit of intellectual adventure, exploration and discovery. Our best scientists are those who, driven by a childlike sense of curiosity and wonder, ‘voyage through strange seas of thought, alone’.

The pursuit of science derives its motive power from what is essentially a creative urge. The painter, the sculptor, the architect and the poet, each in his own way, derives his inspiration from Nature and seeks to represent her through his chosen medium... The man of science, like the exponents of art, subjects himself to a rigorous discipline,... Science is a fusion of man’s aesthetic and intellectual functions devoted to the representation of nature.

— Sir C.V. Raman ¹¹

The Mechanistic World View

The idea that every process in the universe works on essentially *mechanistic principles*, and that mechanistic explanations ought to be sufficient for a complete understanding of *all* phenomena, came to prominence with the rise of mathematical physics based on Newton’s laws, and *culminated in the nineteenth century as a result of the spectacular success of Newton’s discoveries in accounting for the behaviour of physical systems*.¹² These developments in physical science ran parallel with technological developments — it was the age of the industrial revolution, the age of mechanical invention. The way scientists think about natural phenomena is influenced by current technologies and tends to express itself in technological terms. *This is very apparent today, as computer and communications technology rapidly develops*: ways of thinking about and explaining natural phenomena are often expressed in terms of ‘algorithms’, ‘software’ and ‘information’ rather than in terms of ‘forces’ and ‘energy’.

As we shall see in later chapters, *the growing optimism and confidence in the explanatory power of mechanical principles* suffered a severe blow at the beginning of the twentieth century with discoveries

that led to the rise of quantum physics and the concomitant recognition of the limitations of strictly mechanistic causality in physical processes.

The swing away from the mechanistic view of reality in the first half of the twentieth century is clearly revealed in the statements of many eminent scientists.

Today there is a wide measure of agreement, which on the physical side of science approaches almost to unanimity, **that the stream of knowledge is heading towards a non-mechanical reality; the universe begins to look more like a great thought than like a great machine.**

—*Sir James Jeans* ¹³

In recent decades, the prevalence of mechanistic beliefs among scientists has again been on the increase. This trend shows itself particularly **in the growing confidence of the neo-Darwinists** in their conviction that the ‘mechanism’ of evolution is **nothing more than blind chance operating on the replication of DNA molecules**, and the growing belief among scientists that the brains of living creatures are nothing but elaborate computers.¹⁴

The impression given by this increasingly prevalent belief is that science now has the question of ‘life, the universe and everything’ fairly neatly tied up, **that the remaining task of science is that of filling in details**, and that there is nothing essentially mysterious that might lead to a major revision of the fundamentally mechanistic principles. This mechanistic doctrine that has come to prominence at the close of the twentieth century **is curiously reminiscent of the scientific attitude that prevailed at the close of the nineteenth century**. The nineteenth-century mechanistic myth was shattered by new discoveries in physics that revolutionised the physicist’s view of the nature of matter, space, time and causality. Is it possible that the corresponding twentieth century mechanistic doctrine will, similarly, prove inadequate? The believers in the doctrine would regard even the posing of such a question as irrational; **to be ‘rational’, on their terms, is synonymous with implicitly believing in the omnipotence of mechanistic explanatory principles** — all else is supposed to belong to outmoded superstitious ways of thinking. Nevertheless, it is a reasonable question. In the following pages, we shall be searching for possible answers.

Notes and References

1. Jeremias Gotthelf (Albert Bitzius, 1797-1854).
2. Since 1910, books on the 'occult' and the 'supernatural' in America's Library of Congress had been categorised as 'Occult Sciences'. This category label was changed in 1982, out of concern over the growing tide of irrationalism in publications of this kind, and the effect on a public already confused over these matters. The section is now simply labelled 'Occultism'.
3. Rawcliffe 1952, 1959.
4. *ibid.*, p.5.
5. CSICOP, who and why? : in Gardner 1983, p.211.
6. World views in collision: in Hofstadter 1985, p.91.
7. *ibid.*
8. *ibid.*
9. Quoted by Hilary Evans, in Spencer & Evans 1988, p.386.
10. Nietzsche, Friedrich, *The Gay Science (Die Fröhliche Wissenschaft)*, 1887. Quoted by Hollindale, R.J. (ed. & tr.), *A Nietzsche Reader*, Penguin, 1977, p.67.
11. Quoted by G. Venkataraman, in *Journey into Light: Life and Science of C.V. Raman*, Indian Academy of Sciences, Bangalore 1988, p.493.
12. The word 'mechanism' entered scientific terminology in the context of the mechanistic philosophy that regarded every phenomenon as, in principle, amenable to explanation in terms of machine-like modes of operation. The word became peculiarly pervasive and persistent, eventually acquiring a double meaning: *any* explanatory principle or hypothesis can be referred to as a 'mechanism' without implying anything mechanical or machine-like. There are chemical 'mechanisms', biological 'mechanisms', psychological 'mechanisms' and so on. Even quantum theory, which introduced indeterminacy into physics and thereby demolished the old idea that the physical world is essentially machine-like, is generally referred to as quantum '*mechanics*'.
13. Jeans 1937, p.122.
14. Crick 1994.

2 SCIENTIFIC WORLD VIEWS

The Fragmented Unity of Scientific Knowledge

What exactly is ‘science’ and what is it about certain kinds of knowledge and certain ways of thinking that give them the right to be called ‘scientific’? These words are often employed as though everyone is agreed about their meaning. Yet this is not so, even among scientists. I was once part of a discussion group of about thirty scientists, who were called upon, after four sessions, to say what the word ‘science’ meant to them. The answers were (perhaps not surprisingly) very widely varied. Science is a bewilderingly complex human activity. Misconceptions about it abound — for example, that it is about collecting ‘facts’ or that it is a repository of absolute certainties. Scientists certainly *strive* for certainty by careful experiment and observation to test whether their ideas correspond to the real world. That is why information acquired ‘scientifically’ is, generally, reliable information. But when a body of scientific knowledge is used, by extrapolation, to erect and support philosophical speculation of sweeping generality and to give metaphysical doctrines an aura of certainty, we need to be on our guard — the hubris of this pseudo-scientific activity carries with it the danger of falling into dogmatism. There are many examples of this kind of error in the history of science, and we shall examine some of them later. The present opposition of ‘established’ science to parapsychology seems to me to have many of the hallmarks of this kind of error.

The word ‘science’ actually refers to a very wide spectrum of activities: the various ‘sciences’, each with its own allotted territory, its own methodologies and modes of thought, its own practitioners and experts. Usually, an expert in one branch of science has little more than a layman’s knowledge of the preoccupations and discoveries in other branches. Scientists cannot be blamed for this — it is an inevitable consequence of the enormous complexity of the natural world.

Scientific knowledge has a hierarchical structure. When we ask *why* a particular process, whose laws of behaviour are known in the context of one branch of science, behaves as it does, an answer or a partial answer can often be found by appealing to another branch lying at a deeper level of the hierarchy. Thus, for example, chemistry deals with the interaction of molecules with each other. Chemists have formulated their own ‘laws’, and their own ways of thinking about their subject matter, which are very different from the physicists’ laws and

ways of thinking. Yet the interaction of molecules with each other is obviously a *physical* process — the chemist accepts that, in principle, the processes he studies are a manifestation of the behaviour of electrons in highly complicated configurations. In practice, this insight provides very limited predictive power — the *hierarchical gap* is too great. The most he can do with it is to build qualitative or semi-quantitative models to explain how atoms bind to form molecules. Thus the hybrid science ‘physical chemistry’ arises, tenuously bridging the gap. The total impossibility of computing all of chemistry from the physics of electrons is beside the point. The point is that chemical phenomena are what they are *because of physical laws*. Similarly, the biologist studies morphogenesis; he observes and describes how plants grow and how an embryo develops. The science of morphogenesis is not at all like the science of chemistry. Nevertheless, the biologist accepts that the process of morphogenesis is in fact a manifestation of biochemical interactions working at an amazing level of complexity, and that these in turn are driven by genetic messages encoded in DNA. This insight is no help whatever in predicting morphological changes — the hierarchical gap is truly enormous — it provides only a conceptual background and allows us at least to know what *kind* of questions we are asking when we ask ‘why?’ of a morphogenetic process.

As a further example of the answering of a ‘why’ question by a shift to a different explanatory principle, consider gravitation. Newton’s theory postulates an attractive force between any two massive bodies, satisfying an inverse square law. The Newtonian theory has been marvellously successful in explaining and precisely predicting planetary motion. Computations based on Newton’s theory have enabled us to send men to the moon and unmanned probes to the planets. The question ‘why an inverse square law?’ was regarded by Newton as unanswerable. An answer came from a radically different way of thinking about the phenomenon: according to Einstein’s theory, the inverse square law (almost imperceptibly modified) turns out to be an inevitable consequence of the way the way matter makes space-time curved and the way matter responds to the resulting curvature. Of course, we can again ask ‘why?’: why do matter, space and time obey the equations that Einstein proposed? We can never get from science a *final* answer to a ‘why’ question — it is rather like looking up a word in the dictionary; one finds it defined in terms of other words, which can themselves be looked up, and so on...

In these and similar examples we recognize that a phenomenon whose ‘laws’ are known and which is ‘well understood’ in the context of a particular mode of explanation, can look utterly

different when we are able to switch to a different explanatory mode — in particular, when an explanation in terms of a ‘deeper’ hierarchical level is found. There is no contradiction between such alternative modes of explanation. They complement each other; combined, they provide a better understanding.

Determinism

If it were possible to know the position and velocity of every particle in the universe, then we could predict with utter precision the future of those particles and, therefore, the future of the universe.

—Isaac Newton ¹

It seems to me that the test of ‘Do we or do we not understand a particular point in physics?’ is ‘Can we make a mechanical model of it?’

—Lord Kelvin ²

As scientific knowledge progresses, it brings in its wake significant philosophical implications; it alters mankind’s view of the nature of reality — at least for that portion of mankind that is, even remotely, in touch with scientific ideas. Our understanding of our role in the universe, and our understanding of the kind of universe it is, have been radically transformed by the impact of scientific discoveries and scientific theories.

The laws of classical physics are *deterministic* laws. Thus, according to the physics known to Newton and Kelvin, any physical system is governed by deterministic laws. That is to say, the future of the physical world is an inevitable consequence of its present state. This leads to a world view in which the universe is seen to be a vast *mechanism*, inevitably unfolding events that were already implicit in its primordial state. The determinist universe leaves no room for the ‘free will’ of a living creature. Living creatures are simply *automatons* with no more freedom of choice than a pebble swept along by a stream. All this was expressed in poetry long before the discoveries of classical mechanics:

With Earth’s first clay they did the Last Man’s knead,
And then of the Last Harvest sowed the Seed;
Yea, the first Morning of Creation wrote
What the Last Dawn of Reckoning shall read.

— Omar Khayyam (tr. Edward Fitzgerald) ³

I have deliberately presented the deterministic world view, and the logic supporting it, in its most extreme form. I have done so because, in this form, determinism is a particularly simple and vivid example of a scientific *paradigm* — an overall conception of the nature of reality derived from scientific knowledge.

Many arguments purporting to refute determinism seem to miss the point of its inexorable logic. Typically, they appeal to the extreme complexity of the real world and the concomitant hierarchical structure of scientific knowledge. For example, since the exact positions and velocities of a very large number of particles cannot *in fact* be known, we have to use methods that transcend the elementary laws of classical mechanics in order to predict the behaviour of ordinary ‘macroscopic’ things. Thus, for example, statistical mechanics deals in averages of velocities and other collective properties of large numbers of particles, and leads to an understanding of concepts such as pressure and temperature. Fluid dynamics and thermodynamics belong to a hierarchical level where the appropriate concepts are far removed from the elementary dynamical laws of atomic motion. When we come to the behaviour of biological systems the hierarchical gap is much greater. The would-be refuters of determinism then argue that, since it is manifestly absurd to claim that living creatures can be understood by reducing their behaviour to the level of elementary mechanics, Newton’s statement is invalidated. When stated so concisely, the lack of logic in this kind of refutation is, I think, fairly transparent. It confuses what is actually taking place in the real world with what can be known and computed. To assert that a living creature is an automaton is manifestly *not* the same thing as to assert that its behaviour can be, or ever could be, computed and accurately predicted.

A similar failure to understand what is meant by ‘determinism’ has arisen in recent years in connection with the study of nonlinear dynamical systems, that led to chaos theory.⁴ I refer here to the discovery that certain dynamical systems are unpredictable in the sense that an imperceptible perturbation, *however small*, can with the passage of time grow until it has a major effect on the behavior of the system. For example, long-term accurate weather prediction is now known to be impossible, even in principle. This has become known as the ‘butterfly effect’ — the principle of unpredictability is playfully illustrated by the statement that ‘the flapping of a butterfly’s wings in Tokyo can cause a thunderstorm in San Francisco six months later’. However, this lack of predictability is *not* a refutation of determinism — in a deterministic universe the presence of a butterfly in a particular place at a particular time would be, as it were, preordained!

The absolute deterministic causality in the sense in which we have presented it here, and that is encapsulated in Newton's statement, *has* been refuted by developments that took place in physics in the twentieth century. We now know that, at the very small scale of subatomic events, **particles do not strictly follow the deterministic causal laws of classical mechanics** — they are governed by the laws of *quantum mechanics*. We shall take a closer look at what this means in a later chapter. For now, it is sufficient to say that a fundamental principle of quantum mechanics tells us that **'knowing the position and velocity of every particle' is a meaningless concept at subatomic scales**. A particle such as an electron simply does not *have* a precise position *and* a precise velocity at any one time. **There is an element of randomness — of pure chance — in the way systems evolve in time, that is an essential part of the very fabric of reality.**

We have to approach this refutation of the idea of a strictly determined universe with caution. **Classical mechanics remains valid for most large-scale systems and processes** — they consist of billions of elementary particles and the fundamental uncertainties in elementary events get averaged out. The implications of the deterministic viewpoint for most large-scale events would not be expected to be affected. Note also that, even if brains are in some sense quantum mechanical devices (as has been suggested) so that the indeterminacy at the subatomic level could show up in the behaviour of a living creature, this would not of itself endow the creature with 'free will' **it would simply replace what we call 'free will' by an element of arbitrariness and inconsequentiality** in what we think of as our autonomous decisions and intentions. Thus the impact of quantum mechanics on the deterministic world view is, it can be argued, slight. On the other hand, as we shall see, **the philosophical implications of quantum physics are deep and profound and not yet fully revealed**. There are unresolved controversies and paradoxes, still, at the very roots of physical science. Whatever may be the final outcome, there is an important lesson to be drawn from the changes that quantum mechanics brought about in what had become rigid and ingrained habits of thought about the nature of the physical world:

Sweepingly general philosophical statements about the nature of reality, drawn from the current state of scientific knowledge, should be viewed with caution. The search for truth is impeded when they are regarded as final and incontrovertible.

Reductionism

Reductionism is the policy of explaining complex phenomena in terms of something simpler. As a guiding principle in formulating hypotheses

in science, it is essential, and as a policy to adopt when searching for explanations it is wise. But one can detect, in many areas of scientific discourse, a tendency to cling to reductionism as a dogmatic belief, to raise it to the status of a universal principle and to lose sight of the limits of its applicability:

Everything should be made as simple as possible but not simpler.

—Einstein ⁵

We have already dealt at some length with the proposition that chemical interactions are governed by physical laws, since molecules are physical systems. The explanatory power of reductionist thinking reveals itself when we appeal to physics to gain a better understanding of chemical interaction. This is healthy reductionism. Dogmatic reductionism is epitomised, for example, in the assertion that romantic love is ‘nothing but’ biochemistry. The hallmark of this kind of reductionist thinking is its tendency to leap across hierarchical gaps in scientific knowledge. It abounds in statements of the ‘nothing but’ variety and rests content with the simulacrum of understanding that they carry.

The biological sciences come close to the top of what we have visualised as the hierarchy of scientific knowledge — that is, they involve the study of organised matter at its most intricately complex. Biochemistry has made enormous advances in recent decades, so that we are now in a position to appreciate how biological phenomena arise out of an underlying phenomenology of chemical interaction. Hence the typically reductionist attitude that biology is ‘nothing but’ chemistry, which in turn is ‘nothing but’ physics, and the implication that older speculations that postulated some quasi-physical principle (such as ‘vitalism’) thought to be necessary for understanding the distinction between living and non-living things, have proved false. The fact is, they have been discarded because they are not consistent with the — essentially mechanistic — reductionist doctrine, not disproved.

At the top of the hierarchy is the study of the supremely complex instance of organised matter — the living brain. Biochemistry is not adequate, alone, for elucidating the mysterious workings of the brain. We have here yet another hierarchical gap. In the reductionist paradigm, this gap is bridged by the belief that the brain is ‘nothing but’ a biochemical mechanism. Neurophysiology is the relatively new science that attempts to understand the structure and modes of operation of the brain. It encounters the circuits of what is obviously an information-processing device of awe-inspiring complexity.

Understanding is aided by appealing to analogies drawn from computer science. As this discipline develops, more and more of the functions of the brain can be mimicked by computers, and one is led to the reductionist explanation: the brain is 'nothing but' a computer. Thus we seem to be drawn inexorably to the conclusion that life on earth is nothing but an elaborate 'mechanism'. 'Mind' is an illusion; consciousness, volition, feelings, purposes, etc. are illusions — everything is 'merely' physics.

This, in brief, is the reductionist paradigm. Its proponents hold to it with enthusiasm and conviction. Its appeal lies in the *unity* that it sees in the body of scientific knowledge. Its validity would imply that the nature of the world is now, in a broad sense, 'well-understood'. Only details remain to be explored. Nothing essentially mysterious remains to be explained. There is a satisfying sense of completeness about it.

The desire to refute it is, of course, equally strong. The picture it presents is bleak. It leaves only a blind, indifferent Nature, devoid of any underlying meaning or significance, devoid of any purpose:

A tale told by an idiot, full of sound and fury, signifying nothing.

— *Shakespeare* ⁶

Of course, whether a philosophical viewpoint seems appealing or repellent to our human sensibilities is beside the point. Emotional reactions to a paradigm are irrelevant to the question of its truth or falsehood.

The weakness of the reductionist position lies in the way it sets up a rigid conceptual framework and then tacitly denies validity to speculations that do not fit in. The duality of mind and matter, the concept of 'vitalism' that postulated some essentially mysterious distinction between living and non-living matter, the idea that some purposive principle (teleology) might be at work in the origin and evolution of life — indeed, any *non-mechanical* concept whatever — are all dismissed. They have been 'discredited' — deemed to belong to the realm of ignorance and superstition. Once the framework is set up, only reductionist explanations are found because only reductionist explanations are sought and admitted.

We have already drawn attention to the dangers of accepting as final truth any paradigm deduced from the current state of scientific knowledge. Even more dangerous is any tendency to ignore *facts* that don't fit into the paradigm; the reductionist attitude does indeed turn a blind eye to matters of fact that are in conflict with it. Nowhere is this more apparent than in the widely accepted beliefs that have come to

dominate the life sciences. In the rest of this chapter we shall be looking at how this came about.

The Blind Watchmaker

Reductionist arguments are particularly pre-eminent in the modern **explanation for the evolution of life**. For example:

It does seem that the problem is now essentially solved and that the mechanism of adaptation is known. It turns out to be basically materialistic, with no sign of purpose as a working variable in life history... **Man is the result of a purposeless and materialistic process.**

—G.G.Simpson ⁷

Even before the monumental work of Charles Darwin it had been recognised by perceptive individuals (including Charles Darwin's grandfather Erasmus Darwin) that **species arise by a sequence of changes from pre-existing species**. The evidence is in the fossil record. The study of the fossil record reveals, in broad outline but not in detail, **the branching tree-like process whereby invertebrate creatures arise from symbiotic communities of single-celled organisms**, vertebrates (early fishes) evolve from invertebrate ancestors, fishes become reptiles, which in turn are the ancestors of birds and mammals. These are the facts of evolution — this is *how* the unimaginable complexity and variety of life on Earth arose.

Charles Darwin and Alfred Russell Wallace⁸ addressed themselves to **the 'why' of the evolutionary process** — they inquired into its underlying causes. The two key concepts in the Darwinian explanation are the **variations among the individuals of a species, and the effect of 'natural selection' on these variations in the course of many generations**. The effect of *artificial* selection acting on the variations in a species is **evident in the process of selective breeding, which has produced food crops and domestic animals very different from those that mankind first encountered**. These species have been adapted to human needs and foibles, in quite remarkable ways. The theory of Darwin and Wallace views the gamut of life on Earth as the result of a similar process of selection, **operating over enormous periods of time**. The forces that have achieved the selection in this case come from the environment that a species has to contend with, including competition with other species. **In the 'struggle for survival' it is the 'fittest' — i.e. those variants best adapted to environmental conditions — that, in the long run, survive**. This, in broad outline, is the theory proposed by Darwin and Wallace. The evidence to support it came from Darwin's

painstaking efforts of observation and thought, extending over twenty years, that culminated in *The Origin of Species* in 1859. There is no room for doubt that, *in broad outline, the theory is essentially correct.* New species *do* arise by genetic variation from pre-existing species, and natural selection *does* operate in the way Darwin and Wallace suggested. *But in matters of detail, there is room for doubt, as Darwin himself was aware:*

To suppose that the eye with all its inimitable contrivances for adjusting to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic aberration, *could have been formed by natural selection, seems, I freely confess, absurd in the highest degree.*

— Charles Darwin

Darwin felt the need for something more than the normal variations among the individuals of a species, to account for the astonishing transformations that have taken place over vast aeons of time. In fact, all that *selection*, either natural or artificial, can achieve, *if the normal genetic variability is the only raw material it has to work on, is the exploration of the limits of variability within a species that is already potentially there.* It cannot create novelty. The extremes of variation possible within a species, by recombination of genes, can be surprising (think, for example, of the difference between a Great Dane and a dachshund, or between a cauliflower and a Brussels sprout), but *this is a matter of subspecies, not new species.*

Darwin regarded the ‘inheritance of acquired characteristics’ — an evolutionary mechanism proposed much earlier by Lamarck — as a viable candidate for the missing ingredient necessary to make the theory work. *Lamarck’s proposal was that changes brought about in the morphology and behaviour of the individuals of a species as a result of their encounters with the environment could somehow be genetically inherited by their descendants.*

‘Lamarckism’ was abandoned by the majority of biologists when it became clear that *no conceivable ‘mechanism’ could transmit information about adaptive changes in morphology and behaviour, brought about in the lifetime of an individual, to the ‘germ plasm’ that carries the genetic information to be passed on to future generations.* In the 1880s Auguste Weismann⁹ emerged as the leading opponent of the Lamarckian idea. He showed how facts that had been supposed to support the hypothesis of ‘inheritance of acquired characteristics’ were interpretable as instances of inheritance of characteristics that were already present in the genetic make-up of the species. Scientists who

continued to cling to Lamarckian ideas came to be regarded as pseudoscientists out of touch with reality. We shall return to this topic again in chapter 9.

The important role that *mutation* could play in the evolutionary process was first clearly expressed by de Vries in 1901. Mutations are *unexpected* genetic changes that produce individuals with characteristics not previously present. They are thus potentially capable of extending the range of possible variations of a species.

The stage was now set for the modern theory of evolution known as '*neo-Darwinism*'. The only two concepts necessary to account for the whole of evolution, according to neo-Darwinism, are the occurrence of *chance* mutations and natural selection.

A chance mutation is a genetic accident that causes a living organism to have characteristics not possessed by its ancestors. In almost all cases such chance mutations have a deleterious effect. The hypothesis of neo-Darwinism is that, by pure chance, a variation caused in this random way confers some advantage on the affected individual and on those of its descendants that inherit it; they are marginally better adapted to deal with their environment. In such cases, in due course of time, the descendants with the mutant characteristic will be more successful in the 'struggle for survival'. After an enormous number of generations the cumulative effect of many such 'fortuitous' mutations, keeping pace with changing environmental conditions, will have radically altered the form and behaviour patterns of the population. A new species has arisen! By this time, also, the original stock will have become extinct because it failed to keep pace with environmental changes. It is also important to recognise that neo-Darwinism attributes the normal range of genetic variability within a species to chance mutations that have occurred in the past.

This explanation of evolution has become, for the majority of biologists, accepted dogma. The conviction expressed by some of its adherents comes close to fanaticism. Those who are not totally convinced feel, quite naturally, that some degree of scepticism directed against the words 'chance' and 'fortuitous' is warranted. We are asked to believe that all the intricate adaptations and specialisations that we see in living things — the communication system of bees, the mimicry of insect shapes by certain orchids, the web-building skills of spiders, the echo-location system of bats, the wings of a bird, the human brain, and so on (and on and on...), are all adequately accounted for by the cumulative effect of sequences of random genetic accidents. Incredulity is supposed to be laid to rest by remembering that it all took a *very* long time.

The current evolutionary paradigm combines the neo-Darwinian explanation with modern discoveries in molecular biochemistry. The new ingredient is the recognition that chance mutations arise from errors in the genetic code — essentially, from damage to the DNA in the germ cells or copying errors in the replication of DNA. Neo-Darwinian theory relies on the ‘monkeys on typewriters’ argument: a haphazard process of trial and error is bound to produce something meaningful now and then if only it operates for a long enough time.

The most able and dedicated propagandist for the neo-Darwinian view is at present Richard Dawkins. He has presented the arguments supporting the paradigm, with an almost evangelical fervour, in his books *The Selfish Gene* and *The Blind Watchmaker* :

We are survival machines — robot vehicles programmed to preserve the selfish molecules known to us as genes.

— *Richard Dawkins* ¹⁰

Thus, we have a situation in which living things are seen as elaborate mechanisms (the replicators) which have evolved as devices for protecting and ensuring the propagation of the information encoded in the genes that create them. The process of evolution leads to a gradual improvement in the effectiveness of the mechanisms for ensuring that genetic messages are preserved intact and passed on. Indeed, modern biochemistry has revealed wonderfully intricate processes that ensure the repair and correction of ‘copying errors’ in the genetic message. Yet, paradoxically, it is asserted that the underlying cause of the gradual improvement in the means of preserving the genetic message is based on the mistakes that occur in the message! Dawkins draws attention to the paradox and deals with it briefly in the following way:

The answer is that although evolution may seem, in some vague sense, a ‘good thing’, especially since we are the product of it, nothing actually ‘wants’ to evolve. Evolution is something that happens, willy-nilly, in spite of all the efforts of the replicators (and nowadays the genes) to prevent it happening.

— *Richard Dawkins* ¹¹

Let us bring into sharper focus the actual processes that a theory of evolution has to try to explain. Begin with some simple unicellular organisms, living in the sea. After a vast period of time,

their descendants are living in clusters in which individual cells have become specialised and take part in a symbiotic collaboration so that the cluster behaves as a harmonious whole. These clusters are the earliest multicellular organisms. From generation to generation small changes occasionally take place in the form and behaviour of these multicellular organisms. After an unimaginably vast period of time the cumulative effect of all these small changes has become rather noticeable; the descendants of the organisms are the living things we see today: some of them are cabbages, some are elephants, some are butterflies. One of them is you, and another is me. This truly fantastic process is evolution. This is what the neo-Darwinian doctrine claims to have satisfactorily explained. We do not find in the pronouncements of the neo-Darwinists any trace of doubt or reservation:

Chance *alone* is the source of every innovation, of all creation in the biosphere. Pure chance, absolutely free but blind, at the very root of the stupendous edifice of evolution: this central concept of modern biology is no longer one among other possible or conceivable hypotheses. It is today the *sole* conceivable hypothesis, the only one compatible with observed or tested fact. And nothing warrants the supposition (or the hope) that conceptions about this should, or ever could, be revised.

— Jacques Monod ¹²

Fervent assertions of this kind, expressing unshakable conviction in the absolute truth of a hypothesis are, it seems to me, out of place in science. The ‘observed or tested facts’ of evolution are in reality conjectures and tenuous extrapolations drawn from the study of fossils, the interrelatedness of modern species, and current knowledge of the molecular basis of genetics. Unlike most processes studied in science, evolution by its very nature cannot be directly observed and experimented upon. Why, then, are neo-Darwinists so convinced that they are right? The reason for the tenacity of the neo-Darwinists in holding to their convictions would appear to be that, once you have accepted wholeheartedly the belief that all is ‘mechanism’, that the only kind of explanation that has any scientific validity is essentially a mechanical explanation, then you are left with no alternative. If the only tool you have is a hammer, you tend to treat everything as if it were a nail. Rejection of neo-Darwinism would, it seems, necessitate the reintroduction of concepts that lie outside the reductionist belief system — concepts like ‘purpose’ and ‘meaning’. It would necessitate the admission that reality has a depth and mystery that has eluded the

scientific method. And that is just what the convinced reductionist *cannot* accept — that kind of thinking is ‘superstition’; such thoughts have been ‘discredited’ by science.

How, though, do we know that there are no alternatives to be found round the corner? Can we indeed say more than that beliefs are accepted as certain when imagination has run out of steam for generating alternatives? If this is all that there is to it, philosophical (or indeed scientific) ‘certainty’ should not be trusted any more than *not* seeing obstructions in a fog should be trusted.

— Richard Gregory¹³

For those who believe it is the final word, the neo-Darwinian theory gives a satisfactory explanation of how and why the variety and complexity of life on Earth has arisen. For those who do not, all this insistence on randomness and lack of any purpose appears woefully inadequate as an ‘explanation’ of what is actually observed in the living world. Anyone who has watched a spider constructing a web will have marvelled at the instinctive expertise, the unerring precision of its movements, and the way all its actions are orchestrated to achieve the final result, the engineering miracle. Is the ‘knowledge’ inherent in the structure and function of the spider’s brain *really* the ‘fortuitous’ result of millions of accidental faults in the DNA of the spider’s ancestors? To anyone but a devout neo-Darwinist, such a suggestion seems not only incredible, it seems ridiculous. In the words of an eminent biologist:

I freely admit that my objections, my doubts, are of a purely intuitive nature and that they cut a pitiful figure alongside the experimental and mathematical demonstrations that the eminent supporters of modern neo-Darwinism hurl at us. But should a person say he is convinced when he is not? For whatever my denial is worth, I cannot change it to assent.

— Jean Rostand¹⁴

Now let us look more closely at the kinds of assertion we have to accept, in order to conclude that neo-Darwinian explanations are adequate and satisfactory. Is the neo-Darwinian hypothesis *sufficient*? The mutations that give rise to evolutionary change are asserted to be *accidental* — that is to say, purposeless and meaningless. They arise from faults in the genetic message. As one might expect, the result of such faults would be almost invariably a disaster. Usually no viable

organism is formed. At best, the result is a defective organism.¹⁵ Stretching the imagination, it is possible to suppose that in some instances an accidentally mutated variety might have some advantage, rendering the mutated individual better 'fitted to survive'. Neo-Darwinism now steps in and invites us to imagine that *all* of the inconceivable number of transformations that have brought into existence the whole panorama of life on Earth have been *fortuitously* advantageous chance occurrences of this kind.

The counter-arguments, and the *facts* supporting them, have been ably presented by many writers, including eminent biologists. To discuss them in detail here would take us too far from the themes of this book. We shall conclude this chapter with a few indications of the nature of the evidence for the inadequacy of neo-Darwinism. The evidence is extensive: the interested reader is referred to the volumes of essays *Beyond Reductionism*¹⁶ and *Beyond Chance and Necessity*¹⁷, to the section 'Creative Evolution' in Koestler's *Janus*¹⁸, and to the reports of three symposia, entitled *Towards a Theoretical Biology*¹⁹.

The spectacular advances that biochemistry has made in recent decades have been accompanied by a corresponding shift in the preoccupations of evolutionary theorists. In particular, the elucidation of the molecular basis of genetics, and of the molecular changes responsible for mutations, have given rise to the modern version of neo-Darwinism in which the emphasis is on *molecular* evolution. Detailed questions about the evolution of the structure and behaviour of plants and animals have receded more and more into the background. In modern neo-Darwinism, the strategies that living organisms adopt for coping with their environment are admitted as necessary for natural selection to operate, but are seen as peripheral and irrelevant to the 'important' questions, whose answers are to be found by studying 'those selfish molecules known to us as genes'.

What is a gene, and how does it operate? The genetic message is a string of information encoded in the DNA of the chromosomes. A gene is a portion of the message which, re-encoded in RNA, becomes a template on which protein molecules are built. An enzyme is a special kind of protein that acts as a mediator to bring about a specific biochemical interaction. A complex metabolic process typically involves many different enzymes, acting in collaboration. Some enzymes regulate the activity of the genes themselves, so that genes become active or inactive in precise self-regulating patterns. The development of an individual of a species is a result of all this activity — morphogenesis is the unfolding of form from the information contained in the genetic message. The process is a complexly interlinked, harmonious whole, which will not make sense if the

genetic message that initiates it is tampered with in an arbitrary way. A change of the kind that would be necessary to produce a significant evolutionary step would have to proceed from a consistent and in a sense *purposeful* change in the whole gene structure — an intelligible change in the genetic instructions conveyed by the message, **not a fortuitous ‘mistake’ in a single gene.**²⁰

... a bad habit of thought that makes us jump from a gene to a property. To an embryologist who knows the complications of development from genes to phenotype, this kind of short cut means completely faulty reasoning. Let us assume for the sake of argument that a mutation is a simple shift in the nucleic acid sequence. The shift in the DNA is translated to the RNA and so you get a shift in the amino acid sequence of the protein — a tertiary shift. But your protein is not a simple linear chain of polypeptides. The tertiary configuration, the protein chain, is tied together by cross-linkages, by links or bridges that form an organised, three-dimensional structure. You can't shift linear sequences in such a configuration at random without upsetting its cohesion and balance. The ‘mutated’ protein now operates in a context that has not been directly affected by the mutation — the basic requirements for even the first kind of reaction are missing — in other words, it isn't going to work. The mismatch is going to be there from the beginning, and your mutated gene is never going to form even a cell. There must be innumerable such errors occurring that never have a chance to develop, let alone to create an organism that will outbreed other organisms. In other words, what sense does it make to try to infer the number of mutations from the number of detectable changes we find in the terminal product? This kind of thinking leads to astronomical improbabilities.

— *Ludwig von Bertalanffy*²¹

An obvious characteristic of evolution is the way in which, once a successful evolutionary process has begun, it gathers momentum and proceeds in the direction that has been initiated, in successive steps, often relatively rapidly. Examples are the increase in weight and height of horses, which evolved from creatures the size of a dog, the tallness of giraffes, the growth and elaboration of the human brain, the development of the wings and feathers of birds, the evolution of complicated eyes of various kinds from primitive light-sensitive spots,

and so on. The first step seems to initiate an orderly sequence of further changes. These are simply a few obvious examples of sequences of change that are the very essence of the evolutionary process, not an incidental aspect of it.²² There is nothing at all here to support the idea of arbitrary, random sequences of change. What we are seeing are the manifestations of consistent and orderly sequences of genetic transformation, not random sequences.

If evolutionary sequences were really random it would be entirely beyond the bounds of probability to encounter two independent sequences giving rise to species with near-identical morphology. Yet there are several instances of such ‘coincidences’ — the phenomenon is known as ‘convergent evolution’, and it flies in the face of neo-Darwinian explanatory principles. The marsupial mammals of Australia have evolved in isolation from the rest of the world, ever since the Australian landmass separated some sixty million years ago. Yet several Australian species are almost identical in form and behaviour to genetically unrelated species elsewhere. The similarity in skeletal structure between the placental wolf of Europe and North America and the marsupial wolf of Tasmania is particularly striking.²³ A recent surprising discovery seems to indicate that the classification of all bats under a single order, *Chiroptera*, and the implication that they all evolved from a common bat-like ancestor, may need to be revised. Immunological studies seem to reveal that the larger fruit bats and ‘flying foxes’ are genetically closer to the *primates* than to the smaller insect-eating bats. If this is confirmed, it will be another remarkable instance of convergent evolution: flying mammals with membranous wings appear to have arisen twice, by two distinct evolutionary paths.²⁴

The neo-Darwinian explanatory scheme is incapable of coming to terms with blatant facts of evolution such as these. Indeed, neo-Darwinism would appear to be *incompatible* with such facts. The neo-Darwinists have scornfully dismissed the semblance of meaning, design and purpose in nature as an illusion. But the farrago of random events they have replaced it with fails to provide a satisfactory insight into what might account for the illusion.

Evolutionary theory attempts to explain how and why, once self-replicating organisms have appeared on a planet, they will become more and more complex, and more varied in form. But why should any such organisms have arisen in the first place? Any system satisfying the minimal requirements to render it capable of evolving must already have been structured in a highly intricate way. Any reductionist attempt to explain the *origin* of life in terms of random chemical events faces colossal difficulties. Some of these difficulties have been discussed in an entertaining and thought-provoking way by Erich von Däniken.²⁵

Däniken, of course, acquired notoriety, and a reputation as a crank, because of his wild notion that ‘beings from outer space’ created life on Earth. His ‘evidence’ does not seem to me to support such a notion, which would in any case only beg the question by transferring the problem of the origin of life from the surface of the Earth to some other location, without coming any nearer to a solution. (The same is true of Fred Hoyle’s theories²⁶, which also appeal to events elsewhere to account for life’s origins). Nevertheless, Däniken’s discussions with scientists convey very clearly that something is missing from the orthodox (i.e. reductionist) modes of explanation.

Scientists in the grip of reductionist beliefs often react with scorn and ridicule to criticism of their pet theories, especially when such criticisms come from non-scientists. Richard Milton’s *The Facts of Life*²⁷ brings together numerous facts that do not fit comfortably into the Darwinian scheme, and numerous arguments of those who have opposed Darwin’s ideas from their inception and of those who now oppose neo-Darwinism. Some of these counter-arguments originated from those notorious cranks, the ‘creationists’²⁸. In his review of Milton’s book Richard Dawkins²⁹ homed in on this fact and launched a vitriolic attack on Milton — and on his publishers for what he calls their ‘irresponsibility’ in publishing ‘this kind of drivel’.³⁰ He refers to Milton as ‘an unqualified hack’ (Milton is a journalist who has specialised for twenty years in the reporting of science and technology — he is not, as Dawkins is, a university professor). Dawkins’ response has the hallmarks of the reaction of a religious fundamentalist to a blasphemy or a heresy; it does not seem to have occurred to him that in descending to this level of discourse he was damaging his own reputation as a respected member of the scientific community. There are many weaknesses in Milton’s presentation, and gaps in Milton’s knowledge giving rise to blunders which provide Dawkins with some valid points of criticism³¹, but a well-read layman expressing his genuine doubts about a body of scientific theory is *not* a crackpot to be despised along with ‘flat-earthers, perpetual-motion merchants, astrologers and other harmless fruitcakes.’³² It is rather surprising that Milton felt no need to make corrections for the second edition of his book, in response to Dawkins’ *valid* criticisms. I also feel that Milton undermined his own credibility in his presentation of the vagaries and anomalies in some of the dating techniques that underpin the timescales adopted in geology and paleontology — he seems to be attempting to support the preposterous creationist belief that the Earth is only a few thousand years old. (He later denied, not very convincingly, that that was his intention.) Nevertheless, much of Milton’s book consists of *rational and persuasive presentations of arguments that reveal the*

inadequacies of neo-Darwinism. Most of the arguments have been around for quite a time and have been put forward not by cranks but by eminent and respectable scientists. Milton has performed a valuable service in bringing them together in one volume. The arguments are supported by *matters of fact*, to which the rational response would be either a clarification of how the neo-Darwinian hypotheses could account for them, or an acknowledgment of the limitations of the hypotheses. Facts demand serious attention. It matters not a jot whether those who draw attention to them are journalists, scientists or cranks. Facts need to be assimilated into the framework of scientific knowledge, not scoffed at or ignored. They are not going to retreat under the onslaught of unscientific *ad hominem* ridicule and defamation of the kind that has been, sadly, a prominent feature of the debate that Darwin's great work initiated.³³

There is a strong streak of intellectual arrogance and intellectual authoritarianism running through the history of Darwinism... This authoritarian streak is still present in some Darwinists today and is denoted by the outrage and indignation with which they greet any reasoned attempt to expose the theory to debate and to the light of real evidence.

— Richard Milton³⁴

Notes and References

1. Newton, Sir Isaac, *Mathematical Principles of Natural Philosophy*, London 1687.
2. Wm. Thomson, Lord Kelvin, *Lectures on Molecular Dynamics and the Wave Theory of Light*, Johns Hopkins Univ., Baltimore 1884.
3. *The Rubaiyat of Omar Khayyam* (transl. Edward Fitzgerald).
4. See, for example, Gleick, James, *Chaos: Making a New Science*, Heinemann, and Sphere, London 1988.
5. Quoted in Readers' Digest, Oct. 1977.
6. *Macbeth*, act 5, scene 5.
7. Simpson 1950: quoted by Hardy 1950, p.14 and Koestler 1979, p.195.
8. It is rather curious to note that Wallace later became a dedicated investigator of the paranormal. See, for example, Inglis 1985b; Wallace 1866; 1875.
9. Weismann, A., *The Germ Plasm: A Theory of Heredity*, W.Scott, London 1893.
10. Dawkins 1976; Dawkins, R., Selfish genes and selfish memes: in Hofstadter & Dennett (eds) 1982, p.124.
11. Dawkins 1976; Hofstadter & Dennett (eds) 1982, p.129.
12. Monod 1972, p.146: quoted by Koestler 1979, p.173.
13. Gregory 1981; 1984, p.552.
14. Rostand 1962, p.79.
15. The neo-Darwinist Maynard Smith states that 'most mutations lower fitness. If this were not so, evolution would proceed without natural selection.' (Maynard Smith, J., The status of neo-Darwinism, in Waddington (ed.) 1969, p.82). There is surely an illogicality here: even if all mutations were advantageous, natural selection would, obviously, have to be invoked to explain the disappearance of earlier forms not endowed with the advantage. The

- Darwinian scheme is driven by advantageous mutations; the disadvantageous ones are entirely *irrelevant* to it.
16. Koestler & Smythies (eds) 1969.
 17. Lewis (ed.) 1974.
 18. Koestler 1979.
 19. Waddington (ed.) 1968; 1969; 1970.
 20. Goldschmidt introduced the idea of wholesale restructurings of the genome and called them 'systemic mutations'; (Goldschmidt 1940). No such events were observed until the 1960s. Cell cultures grown from cells isolated from vertebrate tissues usually die after a few generations, but occasionally they undergo a change and then the culture can be propagated indefinitely. Green & Todaro found that these adaptive changes seem to involve a complete restructuring of the genome, involving changes in the number of chromosomes and their morphology. See Green, H. & Todaro, G.J., The mammalian cell as a differentiated microorganism, *Ann. Rev. Microbiol.*, 21, 1967, p.574, and Waddington, C.H. in Waddington (ed.) 1969, p.123.
 21. Bertalanffy, L. von: in Koestler & Smythies (eds) 1969.
 22. Astonishingly, Maynard Smith, referring to the initiation of orderly sequences, asserts that 'by and large, such biological events seem not to happen, and it is difficult to see in molecular terms how they could happen.' (Waddington (ed.) 1969, p.85).
 23. Hardy 1965; Koestler 1967; Koestler 1979, chapter 11.
 24. Schreiber, A. *et al.*, *Biological Journal of the Linnean Society*, 51, 1994, p.359; Timson, J., *New Scientist*, 4 Jun. 1994, p.16.
 25. Däniken 1977b, chapter 5.
 26. Hoyle & Wickramasinghe 1981; 1988.
 27. Milton 1992.
 28. The creationists are religious fundamentalists for whom the book of Genesis is a body of fact, divinely revealed. They attempt to support their belief 'scientifically' by attacking Darwinism. They wield considerable political power and pose a very real threat to scientific education in some American states. See Hanson (ed.) 1986.
 29. Dawkins, R., Fossil fool, *New Statesman and Society*, 28 Aug. 1992, p.33.
 30. Dawkins' reply to the self-defence of Milton and his publisher, *New Statesman and Society*, 18 Sep. 1992, p.27.
 31. Milton's discussion of the well-known instance of natural selection, the population shift from the predominance of the light-coloured variety of the moth *Biston betularia* to the predominance of the dark-coloured variety, that occurred when tree bark became blackened by industrial pollution, is particularly muddled and illogical. Hence Dawkins' remark that 'Milton misunderstands the first thing about natural selection.' Nevertheless, the point that Milton is trying to make is essentially correct: the obvious explanation of the population shift (weeding out of the camouflaged variety by predators) *doesn't invoke any evolutionary hypothesis at all*; it is consistent with the notion of a variety of individual characteristics within an *immutable* species. Incidentally, the fact that the dark variety existed at all can be interpreted as evidence that the effect of natural selection had not been as powerful a means of eliminating the 'unfit' as Darwinian theory claims it to be. Incidentally, several biologists have drawn attention to facts that suggest that the 'obvious' explanation in terms of camouflage and predation is not correct – see Lambert, D.M. & Hughes, A.H., in Goodman *et al.* (eds) 1989, p.66.
 32. *ibid.*, ref. 29.

33. A particularly depressing manifestation of this phenomenon was the victimisation of Paul Kammerer: Koestler 1971.
34. Milton 1993, p.298.

3 THE SCOPE AND LIMITATIONS OF SCIENCE

The Scientific Method

Science: knowledge ascertained by observation and experiment, critically tested and brought under general principles.

— *Chambers Dictionary*

The aim of the scientific quest is the acquisition of reliable objective knowledge. A key word here is 'objective'; ideally, a body of knowledge merits the adjective 'scientific' to the extent that it can be regarded as free from subjective overtones associated with the personal psychology of those who have made the observations and of those who have systematised the findings. The bias of the specifically personal imaginative faculties of individuals should not be present within the systematised body of knowledge that constitutes a mature science.

This objectivity is an ideal. All scientific knowledge is human knowledge, so it is questionable whether it can ever totally free itself from characteristics shaped by the very fact that scientists are human beings. The role of the human imagination in the development of science is dominant; scientific speculations, hypotheses and theories are products of the human imaginative faculty. Not, of course, the untrammelled imaginative faculty that gives birth to fantasies, but imagination tempered by the instinct for reasonableness and a respect for well-established facts. Scientific knowledge stored in libraries is dead knowledge; human knowledge *lives* only in human minds. The subjective world of sensation and imagination is the only world any of us can know; truly 'objective' knowledge is forever beyond our reach. 'Objective reality' is unknowable; it is Kant's *Ding an sich*.

The success of science is attributable to the techniques that have been developed for separating *as far as possible*, from accepted scientific knowledge, the subjective elements of human perception and human thinking. The techniques constitute what has come to be known as 'the scientific method'. Perhaps only a small core of what we call scientific knowledge approaches the ideal of absolute objective knowledge. Perhaps only a small core lies beyond any possibility of further modification in the light of future discoveries. The rest is provisional knowledge in the form of hypotheses that have provided

useful explanatory principles and have not been contradicted by observations — scientific knowledge is in a constant state of continuing development.

‘The scientific method’ is not a strictly rigorous strategy for ‘doing science’. There is no precise set of rules and regulations providing a foolproof criterion for deciding what is scientific and what is unscientific. Such criteria as exist are themselves largely subjective. However, from the successes and failures in the history of science one can abstract some general features of successful scientific methodology that serve as guidelines:

- 1) Observations and experiments should be repeatable. Thus, a result of observation or experiment can be accepted into the body of scientific data only if it can be checked by other observers or experimenters. If similar conditions always lead to the same results, then by consensus this fact can be accepted as reliable (objective) information about a phenomenon.
- 2) Scientific knowledge does not consist of lists of ‘facts’ established by repeated observations. Scientific knowledge is *systematised* knowledge. The scientist looks for patterns within the body of well-established facts and formulates tentative explanations — models and hypotheses. The human imagination dominates at this stage.
- 3) A hypothesis that fits only the currently established facts that it sets out to explain scarcely contributes to the growth of science, it simply provides a useful framework for organising factual data. The really important hypotheses are those that have deductive consequences, i.e. those that lead to predictions. They suggest further observations and further experiments and predict the outcomes. These hypotheses can therefore be tested against reality. If their predictions turn out to be false, they have to be modified or discarded. No hypothesis is ever ‘proved’ by the success of its predictions. Only the falsity of incorrect hypotheses can be ‘proved’. Confidence in a viable hypothesis grows as it continues to withstand continued checking and testing in a large number of varied experimental and observational situations. Thus science grows by means of feedback loops: observations stimulate the formulation of hypotheses and hypotheses in turn suggest further observations.
- 4) A scientific *theory* is a self-consistent system of interdependent hypotheses.

Mathematics in Science

Results of observation and experiment are most clearly free of subjective bias **when they are based on measurements**. The raw data for the construction of hypotheses is then in the form of numbers. This kind of observation and experiment concerns itself exclusively with the *quantifiable* aspects of phenomena. The appropriate tool for the systematisation of data acquired in this way is **mathematics**.

The emphasis on measurability and quantifiability in science is sometimes taken to extremes:

When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot express it in numbers, your knowledge of it is of a meagre and unsatisfying kind: it may be the beginning of knowledge, but you have scarcely, in your thought, advanced to the stage of *science*.

— Lord Kelvin ¹

Kelvin is here expressing a belief that has been prevalent since long before the rise of modern science. The resemblance between Kelvin's assertion and that of the Renaissance philosopher **Mirandola** (1463-94) is quite striking:

By number a way may be had for the investigation and understanding of everything possible to be known.

— Pico della Mirandola ²

It could be argued that **this exaggerated reverence for numbers** in the scheme of human knowledge is directly descended from the philosophy of Pythagoras.

It is important to recognise that quantifiability is by no means an essential ingredient of all aspects of science. One has only to think, for example, of **the zoologist observing the life-cycles of animals, or the geologist's understanding of the morphology of landscape, to recognise the legitimacy, in science, of qualitative, descriptive modes of thinking and explaining**. Darwin's *Origin of Species* is a striking example of a major *scientific* work that amply refutes Lord Kelvin's narrow 'numerological' view of what constitutes a science. In spite of such obvious counter-examples, the myth that science should ideally concern itself only with what is measurable and hence quantifiable is

persistent. When adhered to, it often imposes devastating limitations on the pursuit of knowledge.

Notwithstanding its limitations, mathematics is a powerful tool, indispensable in many sciences. In physics especially, its power and scope appear almost miraculous. It seems to have been this spectacular success of mathematical thinking in the physical sciences that gave rise to the dangerous attitude, expressed by Lord Kelvin, that ideas that cannot be formulated mathematically are ‘unscientific’.

Physics is mathematical not because we know so much about the physical world, but because we know so little. It is only its mathematical aspects that we can discover.

— *Bertrand Russell* ³

The idea that all the sciences ought to aim to achieve the ‘scientific purity’ of physics is erroneous. Attempts to mimic the methods of physical sciences where those methods are inappropriate can lead to unnecessarily restrictive methodologies that impede the acquisition of new knowledge. ‘Mathematisation’ of such sciences as biology and psychology, for example, is often nothing more than the application of statistical methods to quantitative data. This procedure undoubtedly has value, but it is useful only when combined with *qualitative* explanatory principles and theories.

We should also bear in mind that mathematics is not just about numbers. Mathematicians are not accountants. Mathematics deals with *pattern* and *structure*. The fact that physics is mathematical is not simply a reflection of the preoccupation of physicists with measurement and quantifiability. Physicists are concerned with these matters only when they make observations and carry out experiments. When formulating hypotheses and constructing theories, they are not. They are then concerned with imaginative constructs, where mathematics is employed as a system of imaginative ideas that provide a basis for speculation.

Limitations

Science is a turtle that says that its shell encloses all things.

— *Charles Fort* ⁴

The scientific approach to the acquisition of knowledge, in its present refined and highly developed form, is fairly recent — a few

hundred years only. Its successes, and its contribution to technology, have been tremendous. It has become the dominant approach, to such an extent that 'unscientific' has come to be a derogatory term denoting superstition, sloppy thinking and foolishness.

The scientific approach has been so eminently successful, within its self-imposed limitations, precisely because of those limitations. It studies just those aspects of the world that it can cope with at any given time. It sets impeccably high standards of corroboration that observational data have to satisfy in order to be accepted as authentic, and is unwilling to pay attention to phenomena whose observational data do not meet these standards. A drawback of this policy is a tendency to presuppose that aspects of reality that lie outside the scope of scientific investigation are unreal, or at any rate not worthy of serious attention. It is important, therefore, to ask what aspects of reality are left out of the picture provided by the scientific world view.

Firstly, it is clear that the insistence that observational data should be *objective* leaves out of the picture a fundamentally important component of reality. It fosters the view of 'reality' as a world 'out there' to be observed and interpreted. A false dichotomy is thus inherent from the outset, and a crucial component, the *sine qua non* of the existence of conscious observers and interpreters, tends to get pushed aside. There is an interesting paradox here, since it is only in the subjective inner worlds of human minds that scientific theories and scientific models of reality are born and have their existence.

That inner worlds of 'subjective' reality are accessible to investigation is demonstrated by the existence of the psycho-analytical approach to psychology. It can be claimed, with some justification, that its methods (introspection, dream analysis, etc.) are 'not scientific'. This may be so; phenomena have to be investigated by whatever methods are appropriate to their nature. Should we consent to remain forever in ignorance of those aspects of reality that do not lend themselves to a rigorously 'scientific' approach?

So many people feel that they have to translate 'subjective' events into 'objective' terms in order to be scientific. To be genuinely scientific is to have valid knowledge of a chosen domain of reality.

— R.D. Laing⁴

There is considerable justification for optimism in expecting further insights into the principles underlying so-called *psychic*

processes. The successes of the physical sciences are due to the adoption of appropriate strategies and techniques, with built-in safeguards against the intrusion of 'human error'. Similarly, the successful investigation of psychic phenomena calls for appropriate strategies and techniques. Under 'psychic phenomena' I include subjective aspects of the mind such as 'states of consciousness', the 'dynamics' of cognition, the elucidation of the structure of the unconscious, and an adequate understanding of the phenomena of parapsychology.

The pioneering work of Jung in these very difficult areas of investigation has already provided a wealth of valuable insights. One might naively suppose that the workings of the unconscious mind lie outside any possibility of investigation. The unconscious mind cannot be directly observed, if it could, it would not be 'unconscious'! But one can investigate the effects, in consciousness, of unconscious processes. By means of painstaking work on the contents of dreams and their relationship to myths and esoteric systems of thought, Jung was able to hypothesise the existence of 'archetypes' — unconscious mental structures that manifest themselves in consciousness in characteristic ways. Jung's essay 'On Psychic Energy' ⁶ identifies striking analogies between dynamical principles operating in the physical world, and psychic processes. In short, a picture emerges of the human psyche as a structured entity whose principles of operation are amenable to investigation. Jung's writings are full of profound insights into the strange inner world of the psyche, and form a systematic body of valuable knowledge about a fundamental aspect of reality quite different from the world of 'objective reality' with which science ordinarily concerns itself.

Secondly, consider the requirement of *repeatability* as a criterion for the validity of observational data. This criterion necessitates that science turn a blind eye to all aspects of reality that, by their very nature, do not lend themselves either to sustained observation or repeatable experimentation. Reported observations of sporadic, ephemeral events are not amenable to scientific investigation. There are very many reports of alleged events for which established modes of scientific explanation cannot account. Charles Fort specialised in the collection of reports of this kind. His books contain thousands of them, gleaned not only from newspapers but also from respected scientific journals. It should not go unmentioned that Fort was eccentric in the extreme. His books are written in a peculiar style and abound in wild speculations and crackpot 'theories'. He continually pokes fun at 'orthodox science'. A delightful biographical sketch of Fort and review

of the absurdities in his writings is contained in Martin Gardner's *Fads and Fallacies*. It is highly likely that Fort's crazy 'theories' were meant as leg-pulling and that he did not himself take them seriously. It was Fort's nature to be sceptical of *everything*, including his own writings. The reports of unexplainable events were found in old newspapers, magazines and journals in the library of the British Museum and the New York public library, during twenty-six years of browsing. *The reports are real*. Fort's off-beat sense of fun in the way he presented them should not get in the way of our assessment of them.

American Journal of Science 1857: It is said that, according to investigations by Prof. Shepard, a luminous substance was seen falling slowly, by Sparkman R. Scriven, a young man of seventeen, at his home, in Charleston, South Carolina, Nov. 16, 1857. It is said that the young man saw a fiery red ball, the size and shape of an orange, strike a fence, breaking, and disappearing. Where this object had struck the fence, was found 'a small bristling mass of black fibers.' According to Prof. Shepard, it was 'a confused aggregate of the finest black hair, varying in length from one tenth to one third of an inch.' ... He wrote that when he analysed the hairs they burnt away, leaving greyish skeletons, and that they were 'composed in part of carbon' and burned with an odour 'most nearly bituminous.'⁷

The oddity and uniqueness of such an occurrence and the vagueness of the data, make it particularly irritating to the scientific mind. There are many thousands of reported occurrences, each of which is odd and unaccountable in its own peculiar way. There seems to be *no* way in which they could be assimilated into scientific knowledge. On the other hand, there are rare and elusive phenomena that reveal themselves in repeated occurrences, but elude scientific investigation because of their rarity. The following reports — taken from Fort's *Book of the Damned* — illustrate this ('the damned', of course, refers to the observational data relegated to obscurity because they do not fit into any established, accepted scheme of things). The following phenomenon was witnessed from the deck of the steamship *Patna* during a voyage up the Persian Gulf:

In May 1880, on a dark night, about 11.30 pm, there suddenly appeared on both sides of the ship an enormous luminous wheel, whirling around, the spokes of which seemed to brush

the ship along. The spokes would be 200 to 300 yards long. Each wheel contained about sixteen spokes, and, although the wheels must have been some 500 to 600 yards in diameter, the spokes could be distinctly seen all the way round. The phosphorescent gleam seemed to glide along the flat surface of the sea, no light being visible above the water. (*Knowledge*, Dec. 28, 1883).

Also in the Persian Gulf:

... luminous wave or pulsations in the water, moving at great speed. On looking towards the East, the appearance was that of a revolving wheel with a centre on that bearing, and the spokes were illuminated, and, looking towards the West, a similar wheel appeared to be revolving, but in the opposite direction... These waves extended from the surface well under the water. (*Nature*, 1875).

In the Malacca Strait:

... shafts which seemed to move round a centre — like the spokes of a wheel — and appeared to be about 300 yards long. The phenomenon lasted about half an hour, during which the ship had travelled six or seven miles. It stopped suddenly. (*Journal of the Royal Meteorological Society*, 1907).⁸

The literature on bizarre, unexplained events is quite extensive. Some 'rare' phenomena have been observed so often that one could almost describe their occurrence as 'relatively common'. Showers of small animals (fishes, frogs, spiders, etc.), and bombardments of stones from untraceable sources are in this category. Others are more unusual. The literature is of variable quality. The books of Charles Berlitz are haphazard collections that pay no attention to the need to refer to the sources of the information. The books of Janet and Colin Bord deal with 'mysterious phenomena' in a more serious way. The only point I wish to make at this stage is that mysterious, inexplicable events, that for various reasons lie outside the scope of scientific investigation, *do* occur.

From the many thousands of anomalous events and phenomena that seem to require a radical shift in our understanding of the nature of reality, if they are to be understood, I single out just one, namely the case of the 'Virginia Mothman'. This is a particularly

interesting example because of the number of independent witnesses and the persistence of the phenomenon over a substantial period of time. A flying creature like a moth with large, luminous red eyes was seen by about two dozen independent witnesses (perhaps we should say, 'percipients') at various times over a period of several months in 1966 and 1967. The creature was over six feet tall. It made its sporadic appearances in the neighbourhood of a disused ammunitions factory on the outskirts of a small town, Point Pleasant, Virginia. The witnesses were, naturally, all terrified by their experience. Their descriptions were all similar. Sightings of UFOs were also reported in the neighbourhood of Point Pleasant, at about the same period.⁹

Paradigms

In every age the common interpretation of the world of things is controlled by some scheme of unchallenged and unsuspected assumptions; and the mind of any individual, however little he may think himself to be in sympathy with his contemporaries, is not an insulated compartment, but more like a pool in one continuous medium — the circumambient atmosphere of his place and time.

—A.N. Whitehead¹⁰

The paradigms¹¹ that human intelligence formulates for understanding the world and its modes of action have a curious robustness. A paradigm, once it has become well-established, is peculiarly resistant to change. New ideas are accepted reluctantly, even, sometimes, by their originators. If they appear to conflict with currently well-established paradigms, they are sometimes seen as a threat and denounced as heretical, and sometimes as superstitious fancies not worthy of serious attention.

The tendency of well-established systems of thought to rigidify and become tyrannically authoritarian is a manifestation of a deep-seated security instinct in the human psyche. Within its rightful limits this instinct is a thing of value; without a respect for consensus and a trust in the known, the scientific acquisition of knowledge could not be sustained. Scientific progress needs safeguards against wild flights of speculation unsupported by observational evidence. But these safeguards sometimes take on a pathological aspect, so that valuable ideas, and even evidence for actual phenomena, are dismissed out of hand.

The most extreme and dangerous examples of the intolerance of new ideas, amounting to paranoia, arise when the paradigms are supposedly based on 'revealed truth' — religious authority. The ridicule and derision that greeted the Copernican sun-centred model of the solar system is well-known. It led to the persecution of Galileo, for writing about the Copernican theory.¹² Brecht's play *Life of Galileo* is a fascinating exploration of the tendency of human beings to cling to familiar ideas and to oppose novel ones. In one scene, we are treated to the spectacle of Galileo's own colleagues telling him why the moons of Jupiter (that Galileo had discovered) could not exist, and *refusing to look through his telescope!* 'Sooner or later, Mr. Galileo will have to face up to the facts. His moons of Jupiter would pierce the crystal sphere.'¹³

Galileo is a prime example of an enlightened scientist who understood clearly that matters of fact must always take precedence over matters of belief. It is therefore particularly curious to note that even he was not immune to the tendency to reject new ideas. Kepler observed the correlation between the motion of the moon and the action of the tides, and put forward the hypothesis of a causal link, thus anticipating the Newtonian theory of gravitation. In commenting on this hypothesis, Galileo remarked:

He [Kepler] has lent an ear and his assent to the moon's dominion over the waters; to occult properties and such like little fancies.¹⁴

In a similar vein, Leibniz derided Newton for the concept of 'action at a distance', accusing him of introducing into science 'occult qualities and miracles'.¹⁵

A well-known example of the tenacity with which human beings cling to outmoded convictions, in the face of evidence against them, is provided by the role of meteorites in scientific knowledge. They were not 'scientifically acceptable' until the nineteenth century. The Swiss mineralogist Deluc said that, if he were to witness the fall of a meteorite, he would not believe his own eyes. Even the brilliant chemist Lavoisier signed a memorandum in 1772, along with other scientists of the Paris Academy of Science, that concluded that 'the falling of stones from the sky is physically impossible.' When the meteorite Barbotan fell in France in 1790 and the fall was witnessed by the mayor and the city council the scientist Berthollet wrote: 'How sad it is that the entire municipality enters folk tales upon an official record,

presenting them as something actually seen, when they cannot be explained by physics or by anything reasonable.’¹⁶

Joseph Priestley discovered the element oxygen in 1774. Antoine Lavoisier repeated Priestley’s experiments and understood their significance: air is composed of several gases, and oxygen is one of them. He also suggested that water, too, is a compound. These insights marked the beginnings of modern chemistry. This was the response of Antoine Baume, the speaker of the Paris Academy of Science:

The elements or base components of bodies have been recognised and determined by physicists of every century and every nation. It is inadmissible that the elements recognised for two thousand years should now be included in the category of compound substances. They have served as the basis of discoveries and theories... We should deprive these discoveries of all credibility if fire, water, air and earth were no longer to count as elements.¹⁷

Throughout Darwin’s lifetime, it was widely believed that the theory of evolution was ‘inconsistent with physics’.¹⁸ The challenge to the theory appeared to be conclusive and unanswerable. Darwin himself was well aware of the objections and was troubled by them. The basic objection came from the calculated lifetime of the sun, based on Newton’s law of cooling, which ‘proved’ that the surface of the Earth could remain within the narrow temperature range necessary to support life for only about 25 million years — a period of time shorter, by several orders of magnitude, than the time needed for Darwin’s scheme of variation and natural selection to work. Nineteenth-century physics, of course, was unaware of the nuclear energy processes that generate and maintain the sun’s heat and that also provide the Earth’s crust with internal heat sources.

J.J.Thomson’s epoch-making paper (1897) announcing his discovery of the electron — a negatively-charged particle with a mass less than a thousandth of the mass of a hydrogen atom — was widely suspected of being a hoax.¹⁹ The current atomic theory left no room for such a nonsensical particle; it was ‘well-known’ that nothing lighter than a hydrogen atom could exist.

Of course, with hindsight, it is tempting to find amusement in the naiveté of earlier ages, and leave it at that. But those who were mistaken in these and similar cases were not naive — they were the eminent thinkers of their day. What they were revealing was not

naïveté, but the fundamental human tendency to cling to well-established paradigms. There is no reason to believe that we of the present age are immune to this tendency. The wise response to these stories would be to ask ourselves: to which dominant paradigms of the present age are we clinging too firmly, and to what phenomena are we turning a blind eye? Those phenomena that do not seem to fit the pattern expected by the currently dominant paradigms are precisely those that need to be carefully investigated and thought about, if a major shift to a superior paradigm is to take place.

At any stage in the development of science, there is a point beyond which we cannot know for certain *exactly* what it is we do and do not understand and *exactly* where a line should be drawn between phenomena that are as yet mysterious and happenings that are frankly incredible. This is not to say that the changes we must look for, in this respect, will be so drastic as to wipe out all our current boundaries and distinctions. Some common core of understanding may be expected to survive all the future changes in scientific theory, just as Newton's ideas survive in our own quite different intellectual context.

— Stephen Toulmin²⁰

The Role of Subjectivity in Science

A significant way in which subjective factors contribute to the course that science takes is through the assessment and interpretation of *evidence* that scientists are continually called upon to make. All human beings encounter the need to consider evidence, in a wide variety of contexts. Most of us have the intuitive feeling that the most reliable evidence is that which comes to us directly via our own personal perceptions — 'seeing is believing'. But this intuitive feeling often turns out to be false. *A priori* expectations based on previous experience play a large part in the mechanisms of perception. Moreover, memories are notoriously prone to error and distortion imposed on them by the imaginative faculty, so that perceptual data becomes less reliable when considerable time has elapsed between a perception and its recall. Thus, even the most 'direct' evidence — the evidence of the senses — is not always reliable. We are on still less secure ground when faced with indirect evidence — evidence in the form of things reported to us.

Direct observation of the world, employing only unaided human perception, was the only data available when science began. The invention of scientific instruments (telescopes, microscopes, spectrographs, electron microscopes, cyclotrons, EEG, ECG, NMR, etc., etc.) gradually rendered science less and less dependent on unaided perception and has opened up whole worlds of phenomena undreamed of by earlier scientists. What would have been the reaction of a Galileo or a Newton, had they realised that in the twentieth century science would be confidently exploring the internal constitution of atoms and the state of the cosmos during its first three minutes? Science has now largely freed itself from reliance on the vagaries of raw perception, and confidence in its power to explore has grown by leaps and bounds. But everything has a price. Science has *chosen* to investigate just those aspects of the world that *can* be investigated without total reliance on direct human perception. When called upon to look into data in the form of *reports of direct perceptual experience*, it feels helpless; it turns away. It turns away on the basis of subjective judgments.

Every human being begins at birth to observe the world, and throughout life builds mental models consisting of imagery, concepts, meanings and beliefs. Certain aspects of what we observe arouse curiosity, and in order to satisfy this curiosity we decide to observe certain phenomena with more care and attention, and we manipulate phenomena to see what will happen. Every infant does this. The greatest scientists are those who retain the infant's irrepressible curiosity. Scientific observations are not arbitrary and indiscriminate — they are based on conscious choices. Science acquires its aims and directions from the choices scientists make about what is worthy of detailed investigation. The scientific experiments that get done in the course of investigation are those that scientists *choose* to do. The basis of these choices is subjective. Subjective factors determine the framework around which scientific knowledge is built. They determine the course that science has taken.

I dare say that no scientist will spend the time and energy required to test a hypothesis unless he is convinced a priori that it has some likelihood of turning out to be supported by the experimental results. On the other hand, I dare say also that no scientist has ever spent time and energy trying to calculate the a priori probability of any hypothesis.

— Arturo Rosenblueth²¹

Notes and References

1. Wm. Thomson, Lord Kelvin, *Popular Lectures and Addresses*, London 1892-94.
2. Pico della Mirandola, *Opera Omnia*, Basle 1572. Quoted by Frances A. Yates, in *The Occult Philosophy in the Elizabethan Age*, Routledge & Kegan Paul, London 1979, p.25.
3. Russell. (I was unable to trace the source of this quotation. I decided to use it anyway, because I like it.)
4. Fort 1919.
5. Laing 1969.
6. Jung 1982b.
7. Fort 1923, p.107.
8. Fort 1919, 1979, chapter 21. Further details about this interesting natural phenomenon are to be found in Corliss 1995.
9. Keel 1975, chapter 18; Bord & Bord 1989, p.153.
10. Whitehead 1925, p.71.
11. See Kahn 1962 for a detailed discussion of the nature of scientific ‘paradigms’.
12. For historical details of Galileo’s confrontation with the church, and the trial that led to his house arrest, see Bronowski 1973, chapter 6.
13. Brecht’s scene is, of course, imaginary, but the attitude it portrays is probably not far removed from the actual attitude of some of Galileo’s contemporaries: See Koestler 1959, Chapter 8.
14. Galileo’s *Dialogue on the Great World Systems*, 1632. Quoted by Koestler 1969, p.429.
15. Koestler 1969, p.429.
16. Koestler 1979, p.322.
17. Däniken 1977b, p.12.
18. Toulmin, Stephen, **The new philosophy of science and the ‘paranormal’**, *Skeptical Inquirer*, 9(no.1),1984, p.48.
19. *ibid.*
20. *ibid.*
21. Rosenblueth 1970, p.ix.

4 THE REALM OF THE QUANTUM

The Beginnings of the Revolution

We have discovered in the physical sciences all that can be discovered. The rest is more and more refined measurement.

— Lord Kelvin ¹

Lord Kelvin's remark, made in a lecture given in 1891, epitomises the confidence that Victorian scientists had in the power and scope of their view of the nature of the physical world. Only a few years later, two major developments were to take place that *fundamentally* changed the face of physics. One was Planck's quantum hypothesis (1900) that undermined the notion that the principles on which the physical world operates could be understood by visualising mechanical models of them; the other was Einstein's relativity (1905) that swept away the older classical ideas about space and time. In the same lecture, Lord Kelvin mentioned 'two small clouds' on the horizon — two little anomalies that needed to be sorted out to make physics final and complete. One was the unexpected result of the Michelson-Morley experiment, that indicated something wrong about the notion of a 'luminiferous ether', and the other was the unexplained spectrum of 'black body radiation'. It turned out that the Michelson-Morley experiment was waiting for relativity theory for its elucidation, and the black body spectrum was waiting for the quantum theory!

The phenomenon of black body radiation is familiar to everyone. When matter — a piece of iron for example — gets hot, it glows. It first becomes red, and as the temperature increases the red turns to yellow and finally to white. At still higher temperatures 'white hot' bodies take on a bluish tinge. Ideally, one can consider a 'black body' (i.e. an object with a surface capable of absorbing radiation of any frequency) in equilibrium with radiation. It emits a characteristic spectrum of radiation that depends only on the temperature. The problem facing the physicist is to predict the characteristic shape of this 'black body spectrum' from calculations based on the known physics of interaction between matter and radiation. In the late nineteenth century various mathematical physicists attempted it, and kept getting the same wrong answer. In fact, the answer they got was not just wrong, it was

absurd — the calculated intensity grew without limit at high frequencies, instead of falling away. We now know that the mistake lay in assuming that matter can emit and absorb energy continuously, in a steady flow. After struggling with the problem for a long time, Max Planck made the disturbing discovery that if you make the hypothesis that radiation of a particular frequency behaves like a stream of particles, each carrying an amount of energy proportional to the frequency of the radiation, then the calculated spectrum fits the experimentally-observed spectrum *exactly*. Planck called the particles ‘quanta’. The problem was solved. But the manner of solution was profoundly paradoxical because it flew in the face of what was already well-established: light and other electromagnetic radiation is a wave phenomenon rather than a stream of particles. Planck himself was not happy about it — thirty years later he referred to his decision to try out the quantum hypothesis as ‘an act of desperation’.

Further confirmation of the quantum hypothesis came a few years later, with Einstein’s explanation of the photo-electric effect — the effect whereby electrons can be knocked out of a metal by shining (ultra-violet) light on to it. If we accept the quantum hypothesis, then we would expect the energy of an emitted electron to depend on the *frequency* rather than the *intensity* of the light, and we would expect that if the frequency is too low electrons will *not* be emitted — because then a single quantum does not have enough energy to dislodge an electron. The phenomenon does indeed have these characteristics, which are totally inexplicable if we think of the light as a wave that carries energy in a continuous flow.

In the seventeenth century a controversy arose between Newton and Huygens, concerning the nature of light. Newton insisted that it consisted of particles, while Huygens was convinced that it travelled as waves. Numerous experiments demonstrating interference and diffraction effects — effects characteristic of wave motion — finally led to the apparently inescapable conclusion: Huygens was right and Newton was wrong. Maxwell’s discovery of the fundamental equations governing electricity and magnetism finally clinched the matter: light turned out to consist of electromagnetic oscillations propagating according to the wave equation. But now, with Planck’s discovery, the controversy takes an unexpected turn, after it had seemed settled once and for all. Huygens and Newton were *both* right! The nature of light is more subtle than either of them could have suspected.

The question ‘Is light a wave, or does it consist of a stream of particles?’ can be answered only by saying that, as a ‘thing in itself’ it

is both. Or it is neither. It will reveal itself either as a wave or as particles according to the kind of question we ask of it — the kind of experiment we set up to study it. This became known as the ‘wave-particle *duality*’. The *actual* nature of light is something that cannot be apprehended in terms of mental models based on our everyday experience at the scale of human perceptions.

The principle of duality could perhaps have much broader applications of a philosophical nature. At least, there seems to be a lesson to be drawn: when two opinions seem to be incompatible, the apparent contradiction may be an artifice generated by ignorance and preconceived ideas. Beliefs about the nature of reality that seem contradictory may in fact be only narrow viewpoints, each revealing a partial truth about an underlying reality too subtle for either to encompass.

Probability Waves

The wave nature of light was established beyond doubt by the famous experiments of Thomas Young in 1801. Think of a parallel beam of light casting onto a wall the shadow of an object consisting of an opaque screen with a slit in it. The shadow will of course contain an image of the slit — a bright band of light. When the slit is made narrower, its image becomes *broader* (also, the edges of the image become fuzzier, and on close inspection the apparent fuzziness is seen to be due to a fine banded structure of the shadow edges). This broadening is due to *diffraction*; the light of the beam has a tendency to spread out after passing through the slit — a behaviour that is characteristic of wave motion (analogues can be observed with sound waves or with ripples on the surface of water).

Now suppose that the screen has *two parallel* slits. If they are very close together, a new phenomenon takes over. The pattern of light on the wall becomes a series of equidistant bright and dark bands. The smaller the distance between the two slits, the more widely-spaced become the bright and dark bands. This is explained by *interference*, another phenomenon characteristic of wave motion. It can be compared, for example, to the effect you see if you throw two pebbles into a pond. The two spreading patterns of concentric circles of ripples interfere with each other. Where two crests come together they reinforce each other to produce a higher crest and where two troughs come together they reinforce each other to produce a deeper trough. On the other hand, wherever a crest and a trough meet they cancel each other out. The bright and dark bands in Young’s experiment are exactly

analogous: the bright bands occur where the two patterns of ‘ripples’ of light spreading out from the two slits have reinforced each other, and the dark bands occur where they have cancelled each other out.

It should be mentioned that, if white light is used, the interference pattern will be a superposition of the patterns produced by all the colours of which white light is composed. Young used monochromatic light — light of a single colour. Only with monochromatic light does the pattern of bright and dark bands have a simple and unambiguous appearance. This is because monochromatic light consists of waves of a single wavelength.

How do Young’s experiments tie in with the particle nature of light? To try to answer this question, let us suppose that the wall is replaced by a photographic plate and that the intensity and duration of the beam is reduced so that there is only a *single quantum* of radiation. It will, we shall suppose, produce a single spot on the photographic plate, showing where the quantum hit the plate. One might now ask ‘Which of the two slits did the particle pass through on its way to the plate?’ The surprising answer is that this question makes no sense — even a single quantum somehow manages to behave like a wave and pass through both slits at once, and yet it also manages to behave like a particle when it hits the photographic plate at a particular spot! Indeed, if this one-quantum experiment is repeated many times, the spots will gradually build up a grainy picture of the light and dark bands of Young’s experiment. One could even carry out a lot of such single-quantum experiments in different places and on different occasions and then superimpose the plates. A grainy picture of the typical interference pattern of bright and dark bands would *still* emerge from all the spots!

Clearly, there is no way of predicting, in any one of these single-quantum experiments, *where* on the plate the particle will make its mark. It is a *random* event. All that we can say in advance is that there are definite *probabilities* for the mark to appear in particular areas of the plate. There are regions of high probability and regions of low probability, corresponding to the bright and dark bands of the interference pattern, respectively. So we can deduce from all this that, even for only one particle of light, there is an associated wave, and that this wave carries information about the various probabilities. It is a *probability wave*.

Further Developments

Electrons were discovered by J.J.Thomson in 1897. This discovery demolished the idea that electricity was like an indivisible fluid, and it

demolished the idea that atoms were indivisible particles. In the next few years a picture of an atom emerged that was rather like a miniature solar system, with electrons orbiting a nucleus the way planets orbit the sun. In 1913 Niels Bohr applied Planck's quantum hypothesis to this basic picture, and produced an atomic theory in which an electron could jump from one orbit to another, emitting or absorbing a quantum of energy as it did so. His theory gave a beautiful explanation of the science of spectroscopy; it accounted for the way atoms of particular elements emit and absorb energies of very specific frequencies (an atom has a characteristic spectrum that is like a signature and enables it to be identified) and it provided a means of calculating these frequencies. The success of Bohr's theory was a spectacular confirmation of the quantum hypothesis.

By the end of the nineteenth century physicists had built up a successful picture of physical reality that consisted of two quite different kinds of things. There was 'matter', made out of 'particles', and there were 'fields' that pervaded the space between particles. The phenomena of nature were regarded as the consequences of the interaction between the particles and the fields. (For example, a magnet is surrounded by a magnetic field, which is detectable by its effect on matter — e.g. bits of iron — in the vicinity; the Earth is surrounded by a gravitational field, that causes objects to fall to the ground and holds the moon in its orbit; and so on.) Maxwell's beautifully elegant mathematical theory had demonstrated that radiation is an oscillation of the electromagnetic field — waves of electromagnetism. At the end of the nineteenth century, the explanatory power of the mathematical methods based on this matter/field picture had proved so successful that they seemed to contain all that could be said — and all that needed to be said — about the nature of the physical world. Even the revolutionary changes in physics brought about by Einstein's relativity theories did not contradict the basic assumption that every physical entity was *either field or matter*. The special theory of relativity (1905) modified the equations of classical Newtonian dynamics and indicated that material particles as well as fields were both forms of energy, and in principle interconvertible. The general theory of relativity (1916) showed how the gravitational field could be understood as a geometrical property of space and time. The fundamental classification of the manifestations of energy, as either particle or field, remained.

The quantum hypothesis, on the other hand, struck at the foundations more drastically. The clear-cut distinction between the 'field' concept and the 'particle' concept was undermined, in a disturbingly paradoxical way. The full extent of the disruption of

‘classical’ physics was revealed when it was recognised that the wave-particle duality applied *not only* to electromagnetic radiation. It is *universal*, applicable also to ‘material’ particles. It was Prince Louis de Broglie who first suspected this. In his 1923 doctoral dissertation he showed how the mathematical formulae that connect the quantum aspects of radiation with its wave aspects can be extended so that, for example, electrons can be regarded as the ‘quanta’ of an ‘electron field’ in the same way that particles of light (‘photons’) are the quanta of the electromagnetic field. This was amply confirmed a few years later by the experiments of Davisson and Germer, which demonstrated diffraction and interference effects in beams of electrons.²

So the dichotomy between the ‘field’ aspects and the ‘particle’ aspects of nature turned out to be an illusion. Nature simply does not work that way.

The quantum theory eventually grew to become an elaborate and elegant mathematical structure that has evolved gradually throughout the twentieth century. It is of necessity highly abstract — the possibility of conceptualising physical reality in the realm of elementary particles/fields in terms of the kinds of ‘mechanical models’ characteristic of classical physical theories *is no longer possible*. That the theory is substantially correct has been wonderfully confirmed by countless experiments — some of the most astonishingly accurate agreements between theory and experiment have been provided by the quantum theory.

It is not appropriate here to enter deeply into the technical details of the quantum theory in its present mature form. However, something of its flavour can be conveyed by looking at its key concepts and their epistemological implications.

The Uncertainty Principle

In 1925 Erwin Schrödinger devised his famous equation — the equation that governs the behaviour of the ‘electron field’. It describes how the electron field ψ (psi) evolves with time. According to this prescription atoms are not at all like miniature solar systems. The nucleus of an atom is surrounded, not by orbiting particles but by clouds of ‘psi field’ in peculiar configurations called ‘atomic orbitals’. One can use either Bohr’s theory or Schrödinger’s theory to compute (at least in principle and, in relatively simple cases, in practice) the characteristic frequencies of atomic spectra. Both yield correct results. Dirac’s more refined and sophisticated equation for the electron brought Schrödinger’s idea into line with the theory of relativity and

incorporates the fact that (from the particle viewpoint!) electrons are spinning. It accounted for the subtle details of atomic spectra that are a consequence of electron spin, and it indicated the existence of the electron's 'anti-particle', the positron.

The paradox posed by the 'wave-particle duality' now becomes severely problematical. How on earth can one reconcile two such totally different descriptions of the same reality — the particle description and the psi-field description of the behaviour of electrons?

The reconciliation of the two viewpoints, field versus particle, comes from the *probabilistic interpretation of the psi field*, first clearly understood and explained by Max Born. Suppose you set up an experiment to measure some *particle* property of an electron — its spin, its position or its velocity, for example. In general, there will be a range of possible outcomes — a range of possible values that the measured quantity can turn out to have — each with its own associated *a priori* probability. The psi-field is the *carrier of this range of possibilities and the probabilities associated with them*. One can say that, before the position (say) of a particle is actually *observed*, it cannot be properly said to *have a position*, it only has various probabilities of turning up in this or that place; it is in fact only a 'psi-field', not a 'particle' at all. Only when you do the experiment, when you actually ascertain its position by measurement, does it acquire a position. It has then acquired a property characteristic of a particle, namely, the property of being in a particular place at a particular time.

Physical properties that can be ascertained by setting up experiments to measure them are called '*observables*'. In Schrödinger's version of quantum mechanics the psi-field is what determines the various possible values of observables and assigns various probabilities to them. The psi field itself is *not* observable. It cannot be measured or ascertained, even in principle. An alternative approach to quantum mechanics is the 'matrix mechanics' of Heisenberg. Heisenberg's mathematical scheme operates only with observables and their associated probabilities, without introducing the notion of an underlying field. The Schrödinger formulation and the Heisenberg formulation turned out to be equivalent. The Schrödinger formulation is, however, somewhat less abstract and lends itself better to an intuitive, non-mathematical discussion of quantum-physics principles.

The probabilistic nature of events in the world of elementary 'particles' means, of course, that the strictly deterministic causality of older physical theory does not apply. The result of observing a physical system is *not* precisely determined by the state of the system at an earlier time; an element of *chance* is involved. Many physicists were

unhappy with this aspect of quantum theory. Some still are. Einstein, in particular, was deeply disturbed by the way the element of *pure chance* had entered into physics at such a fundamental level, and never became reconciled to this new and unexpected direction that physics had taken. His doubts are neatly summed up in his famous dictum ‘God doesn’t play dice’.

To eliminate the element of randomness one might imagine the possibility, at least in principle, of measuring *all* the particle properties of a system precisely. It would then be a system of ‘classical’ particles that would continue to move and interact with each other according to the deterministic laws of Newtonian physics. One could then conclude that the element of randomness is not fundamental at all, but merely a reflection of our ignorance about some of the data. However, this is not so. Observables belong to complementary pairs, with the property that an increase of accuracy in the measurement of one of the observables of a pair is paid for by a necessary decrease in the accuracy with which the other can be known. This is known as the *principle of complementarity* or *Heisenberg’s uncertainty principle*. One such complementary pair consists of the *position* and the *momentum* (mass times velocity) of a particle.

To see intuitively why the position and the momentum of a particle cannot be simultaneously known with any desired precision, imagine observing a particle through a microscope. The wavelength of the light puts a limit on the resolution of the image and hence limits the accuracy with which its position can be observed. To measure the position of the particle more accurately, we have to use radiation of shorter wavelengths (higher frequencies). But then, according to Planck’s law, radiation of higher frequencies has quanta of greater energy. Thus, in the quest for more precise knowledge of the position of the particle, a stage is reached where the *recoil* of the particle as each quantum bounces off it is no longer negligible. Each quantum that hits the particle imparts an undetermined momentum to the particle, and the indeterminacy is increased by increasing the energy of the quanta. In this way, increasing the accuracy of knowledge of the particle’s position entails a decrease in the accuracy of knowledge about its momentum.

Another illustration of the uncertainty principle as it applies to position and momentum is provided by Young’s single-slit experiment. Note that the momentum of every quantum is fairly accurately known *before* the quanta pass through the slit. It is determined by the intensity and direction of the beam. The slit provides some kind of position measurement — we at least know that the positions of all the quanta

that are passing through are somewhere within the width of the slit! Narrowing the slit is thus an increase in accuracy of a *position measurement*. The concomitant uncertainty in *momentum* that this introduces means that the quanta emerge from the slit with *uncertainties in their directions*. This is why the beam spreads out after passing through the slit, and why the spread increases as the slit is made narrower.

These qualitative arguments serve to lend plausibility to the uncertainty principle. More refined versions of them can be developed into mathematical derivations of the quantitative statement embodied in Heisenberg's uncertainty relation; this is frequently the approach adopted in introductory quantum-mechanics textbooks. Unfortunately, it can lead to the misunderstanding that the principle itself is only about limitations on possible knowledge, imposed by the irreducible clumsiness of measuring techniques. *The principle is more fundamental than that*. It reveals that a particle such as a photon or an electron *never actually has a precise position and a precise momentum* — it is not a 'particle' in that sense at all. Think again of the series of single-photon double-slit experiments. The interference pattern clearly could not arise if each photon passed through one or other of the slits. *The position uncertainty* — i.e. the ambiguity as to which of the slits it went through — *is thus not just a matter of our lack of knowledge of the answer: it is a fundamental uncertainty inherent in the nature of the photon itself*.

The uncertainty principle is a universal principle applying even to 'particles' that are not thought of as 'elementary'. *Experiments have demonstrated interference phenomena with beams of atoms, and even with small molecules.*² *In principle* even the positions and momenta of large things like billiard balls and cars have the same kind of imprecision, and these things, too, have a wave-particle duality. *They obey the laws of the earlier 'classical' physics simply because the uncertainties are utterly negligible at these large scales.*

Observations

The fully-evolved quantum theory provides a picture of physical reality in which any physical system whatsoever consists of a variety of quantum fields interacting with each other. As long as the system is not *observed*, the field configuration that constitutes it evolves *deterministically*, governed by a universal equation known as Schrödinger's equation (not to be confused with the equation of the same name that gives a non-relativistic approximation to the behaviour of a single electron). The fields, though behaving deterministically, are

carrying the probabilities for the outcomes of any observation that might be made. An actual observation narrows the range of possibilities for some aspects of the system. That is what an ‘observation’ or a ‘measurement’ is — something that reduces the vagueness of quantifiable knowledge about an ‘observable’. At the same time, the complementary aspects inevitably become vaguer. Thus an act of observation adjusts the various probabilities carried by the fields; it changes the field configuration in a *non-deterministic* way. This process is called, in the jargon of quantum physics, the ‘collapse of the wavefunction’ or the ‘reduction of the state vector’, or simply a *transition*. The system then continues to evolve deterministically until another ‘observation’ is made.

The sophisticated mathematical machinery of modern ‘relativistic quantum field theory’ provides astonishingly accurate agreements with experiment. It is a remarkably successful theory. Yet there is something very baffling about its conceptual basis, something profoundly paradoxical indicating that, in spite of its great success, quantum theory cannot be regarded as an ultimate theory of physical reality. The paradox is revealed when we ask, ‘What exactly *is* an ‘observation’?’

Observations carried out on a sub-atomic system can be described in terms of an interaction between the system and a measuring apparatus. Things are arranged so that the effect of the system on the apparatus is a ‘macroscopic’ effect — i.e. an effect at the level and scale at which *classical* physics can safely be applied. For example, a macroscopic effect might be a pointer reading, a spot on a photographic plate or a track in a bubble chamber, recording the measured value of an observable or set of observables. Thus, by ‘magnifying’ a quantum-mechanical observable to the ‘classical level’, the uncertainty in its value has been reduced. That is all very well; it is just a description of how experiments are actually done. But an inconsistency has crept in. The quantum theory assures us that the measuring apparatus is *itself* a configuration of interacting quantum fields (albeit an exceedingly complicated one). There is nothing in the theory to tell us why the transition has to take place. According to the theory, the fields can continue to carry all possible outcomes — all possible pointer readings for example — together with their associated probabilities. There is nothing in the quantum theory to tell us how or why just one of these possibilities has been randomly selected and given the status of ‘reality’, nothing to tell us why the wavefunction suddenly decides to collapse, nothing to account for the abrupt non-deterministic transition to a new field configuration.

The paradox becomes even more startling in Schrödinger's³ 'thought-experiment', in which the measuring apparatus is a cat and the two possible outcomes are 'the cat is alive' and 'the cat is dead'.

Schrödinger's Cat

We have been following the implications of quantum theory, and we seem to have been led to a conclusion that can now be summarised: an unobserved physical system carries implicitly all the possible outcomes of any observation that might be made on it, together with the attendant probabilities of those outcomes.

In the course of thinking about this, and trying to gain a clearer understanding of the role of 'observation' in quantum mechanics, Schrödinger came up with the following imaginary experiment to determine whether a radioactive atom has decayed or not. The decay of a radioactive atom is an archetypally random event; there is no way of predicting when it will happen, but in a given period of time there is a definite *probability* of it happening. The 'apparatus' is a box containing the atom, a capsule of poisonous gas, a device to break the capsule and release the gas if the atom decays, and a cat. The box remains closed for a period of time that will give the cat a fifty-fifty chance; either the atom decays and the cat dies, or it does not, and the cat survives. At the end of this time, an *observation* is made: a physicist opens the box to see whether the cat is dead or alive.

While the box remained closed, its contents were an *unobserved physical system*. The quantum-mechanical interpretation of the experiment, therefore, is that the fields that comprise it carried both possible outcomes of the final observation. While the box remained closed the cat was neither dead nor alive; it was, in the jargon of quantum-mechanics, 'in a superposition of states'! This is of course nonsense. The puzzle is that this description is perfectly compatible with the principles of quantum theory. Thus, in spite of its resounding successes, the quantum theory fails to give a satisfying account of objective reality. A superposition of states, according to the theory, is not essentially different from a 'pure' state. Indeed, whether a system is in a pure state or a superposition of states is not a property of the system, but is dependent on the set of observables you choose to measure. When you measure the spin of an electron about a chosen axis, there are two possible outcomes — it spins either clockwise or anticlockwise. Before the measurement it has to be regarded, for fundamental reasons, as being in a superposition of these two spin states. In principle, the two spin states of an electron are analogous,

from the point of view of quantum theory, to the two states of the cat — the only difference is that the cat is a rather more complicated physical system.

One can try to resolve the absurdity by taking the view that quantum mechanics is not a theory of objective reality, but rather a theory of our *knowledge* of reality. One can then maintain that it was not the cat that was in a superposition of states, but the physicist's knowledge of the state of the cat. The transition (collapse of the wavefunction) takes place in the physicist's knowledge, when he opens the box. According to this view, nothing can be said about the state of the cat while the box is closed. The notion of 'objective reality' disappears from the picture. This looks like a more commonsense view, and has been advocated as an interpretation of quantum mechanics. However, its solipsistic overtones, reminiscent of Berkeley's Idealism, leaves us with the problem of having to account for the fact that observations by different observers — and different observations by the same observer — intermesh and build up a consistent description of an objective world. For example, the cat as well as the physicist is an 'observer' (while it is alive and awake) and its view of the matter is quite different from that of the physicist in his ambiguous state, waiting outside the box. Moreover, we are involved in a contradiction in maintaining that transitions take place only in the knowledge of observers, not in physical systems, because observers, too, are physical systems.

The fact that the cat is an observer introduces unnecessary complications into the situation. They can be eliminated by removing the poor cat and replacing it by a light bulb that comes on if the atom decays; Schrödinger chose a cat only to make us pay attention! But then why not go further, and replace the *physicist* by a camera that automatically photographs the light bulb. Can we then still say that an 'observation' has been made? Why should we? We can regard the film in the camera as being in a superposition of states until such time as someone comes along, develops it, and 'observes' it. Considerable time could elapse before that happens — the collapse of the wavefunction can be postponed indefinitely. And why should we assign to the 'observer' who finally looks at the developed film the special privilege of being able to collapse the wavefunction — to make one of two potential possibilities 'real'? In what way is he different from the camera? If we maintain that an observer is just an arrangement of quantum fields capable of recording, processing and transmitting information, we seem to be forced to conclude that the wavefunction

never collapses. This leads to the bizarre ‘Many Worlds’ interpretation of quantum mechanics that we shall meet next.

Another way out is to maintain that something more than interacting quantum fields is needed to complete the picture of the real world — *some concept that the quantum-mechanical picture has left out*, that is needed to understand what an ‘observation’ is, and how it is related to the collapse of the wavefunction. Wigner⁴ has proposed that the missing ingredient is *consciousness*. Conscious observers such as physicists and cats don’t just record information like a camera or any other ‘measuring device’, they acquire knowledge. Of course, this does little to resolve the conceptual difficulties, *since no-one can say what consciousness is*, nor how it is related to the rest of the world. Wigner’s views, however, do serve to emphasise that radically new ways of thinking will be needed if the present conceptual difficulties raised by quantum theory are ever to be resolved.

The Many Worlds Interpretation

The garden of Forking Paths is an incomplete, but not false, image of the universe as Ts’ui Pên conceived it. In contrast to Newton and Schopenhauer, your ancestor did not believe in a uniform, absolute time. *He believed in an infinite series of times, in a growing, dizzying net of divergent, convergent and parallel times*. This network of times, which approached one another, forked, broke off, or were unaware of each other for centuries, embraces *all* possibilities of time. *We do not exist in the majority of these times; in some, you exist, and not I; in others I, and not you; in others, both of us.*

— *Jorge Luis Borges* ⁵

Suppose we try to cut through the conceptual difficulties we have now encountered by adopting *a radically different interpretation of quantum mechanics*, proposed by Hugh Everett⁶ in 1957. This interpretation postulates that *these abrupt transitions (‘collapse of the wavefunction’) don’t ever occur*, that the universe has evolved and continues to evolve, ever since it began with a big bang, according to the deterministic law given by the universal Schrödinger equation. *Then what ‘exists’ is a configuration of quantum fields that carry all possible universes that the big bang could give rise to.* The ‘state’ of this system is a gigantic superposition that encompasses all possible universes. This bizarre picture of reality is consistent with the quantum

theory, and it removes the difficulties we encounter when we try to understand how and why sudden undetermined transitions occur and how they are related to observation.

According to the Many Worlds interpretation, the cat alive and the cat dead, in Schrödinger's experiment, both exist and both are *equally real*. But they exist in *alternate realities*. When a physicist observes, say, the dead state of the cat, another physicist (or, rather, another 'state' of the same physicist) observes the live state of the cat. Both are equally real. (We ignore the fact that, since this is a thought-experiment, neither are real!) The paradox is removed. The price we have to pay is to accept a model of reality that contains all possible worlds. *Nothing that could possibly happen fails to happen*; all that 'might have happened' actually *did* happen in some alternate reality, according to the Many Worlds interpretation.

Although all possible universes are conceived of as 'existing', in this interpretation, *there is a sense in which they are not all 'equally real'*. To see why this should be so, picture the simultaneous evolution of all possible states of the world *as a branching, tree-like structure of stupendous complexity*. The universe that we find ourselves in, that we observe, has evolved *as a path traced on this 'tree of time'*, picking its way at random among the forking branches. (Strictly speaking, the world we observe is not a single path, but an ensemble of paths — observed reality is never precise, the uncertainty principle ensures that — there is an essential 'fuzziness' about it. This fuzziness, however, is not relevant here.) According to the Many Worlds interpretation *'physical reality' is the ensemble of all possible paths*. Each path has an associated probability, calculable, in principle (!), from the probabilities that quantum mechanics assigns to the various branches at each forking. The paths of high probability are those whose meanderings are truly random in the sense that they obey the statistical laws predicted by quantum-mechanical probabilities. *The paths of low probability, on the other hand, are those that violate these statistical laws*. The world that we find ourselves in, then, is a 'highly probable' one in this sense — in the sense that the statistical laws of physics are found to be valid. (In *another* sense it could be claimed that our world is an improbable one, because the *a priori* probability that intelligent life will evolve is *extremely low*. On the other hand, those worlds without intelligent life are not 'observed' at all — so we should modify our claim, and state only that among those worlds in which 'observers' exist, ours is a highly probable one). *Now consider our counterparts in some of the highly improbable worlds — intelligent observers observing gross deviations from what we would think of as 'reasonable' physics*. Are

they ‘real’ in the same sense that we are? It seems more reasonable to take the view that the path *we* are on is the ‘real’ one’ and that the other worlds of the Many Worlds interpretation are simply abstract concepts to make the Many Worlds formulation of physics work. But then the Many Worlds view collapses and we are back where we started! A more radical possibility would be to abandon our ingrained assumption that ‘existence’ is a binary concept — that things are either ‘real’ or ‘unreal’ — and to entertain the possibility of attributing various *degrees* of reality to the various alternative Worlds.

Metaphysical Speculation

The various ‘interpretations’ of quantum theory that we have been exploring fail to provide a satisfying account of the objective reality underlying the testable observational predictions of the theory. If one takes the view that the purpose of physics is to provide computational methods that accurately predict the outcome of experimental observations, one can claim that the ‘interpretations’ are redundant. Quantum theory ‘works’; the various interpretations are therefore unnecessary speculations of a ‘metaphysical’ nature. Indeed, they do not seem to provide testable hypotheses that would serve to distinguish them and to single out one interpretation as ‘correct’. A superposition of two states with different values of a *discrete* observable (such as spin up/down (clockwise/anticlockwise) for an electron or life/death for a cat) is not observable, even in principle, since the very nature of ‘observation’ is to pick out one or other of the alternatives. To talk of the existence of such a superposition in ‘objective reality’ is therefore meaningless. ‘Interpreting’ quantum theory, it can be argued, is therefore a futile attempt to get beyond what is knowable; all that can be known is the result of observation. For us, observational knowledge *is* reality. ‘Objective’ reality is a myth that quantum theory tells us is best forgotten.

This is not my view. I do not regard the principal aim of physical science as the search for computational methods for predicting the outcome of experiments. I regard that as subsidiary to and supportive of its real aim, which is the search for *understanding* of the world we live in. It seems to me that the quantum theory has succeeded splendidly in providing computational methods, but that the tantalising conceptual paradoxes it has landed us in show that it has failed to provide a satisfying sense of having really *understood*. The construction of ‘metaphysical’ speculations is a natural response of human curiosity in the face of the ill-understood.

Some deeper, more epistemologically satisfying future theory *may* one day be found that will incorporate the present physical theories in some way — just as the present relativistic quantum theory incorporates, rather than contradicts, the older ‘classical’ theories of physics. But that can only happen if, as in the past, we are willing to question our apparently basic assumptions and occasionally to speculate beyond what we presently believe to be the limits of possible knowledge.

I shall now proceed to consider another speculative interpretation of quantum physics, that comes from taking the commonsense view that the collapse of the wavefunction that is alleged to take place in Schrodinger’s cat experiment has nothing to do with the physicist’s act of observation. If the atom does not decay, no such collapse takes place. If it does, the mysterious collapse of the wavefunction is the collapse of the wavefunction *of the atom*, and the subsequent events — the death of the cat and the physicist’s observation of a dead cat — proceed deterministically as a result of this random event. The act of observation performed by the physicist is not at all the same kind of thing as the quantum-mechanical ‘observation’ that takes place when a measuring device ‘magnifies a quantum effect to the classical level’ and in doing so causes the wavefunction of the observed subatomic system to collapse. The physicist’s act of opening the box and looking in clearly does not ‘disturb the system’ in this sense.

[The languages of science]... can mislead on occasion. Science cannot advance without such languages. But without a full and complete understanding of these languages there can be no guarantee against false inference and false prediction.

— David Harvey⁷

Quantum theory tells us that a certain kind of configuration of interacting fields can undergo a *transition* to a different, related configuration, and that this is a nondeterministic event; it takes place *at random*. The initial configuration carries information about the range of possible new configurations and the various probabilities that the possible transitions will take place in a given period of time. We have been deceived by a misuse of words into believing that these transitions are necessarily something to do with the concepts ‘measuring’ and ‘observing’, in their usual sense. We have seen that the kind of ‘measurement needed to ‘observe’ a subatomic system sets up conditions that precipitate a transition. But there are other kinds of

measurement and observation that do not precipitate transitions (for example, measuring a metre of cloth; *or observing a cat*), and transitions can occur in the absence of measurement and observation.⁸ This is at the root of Schrödinger's cat paradox.

The interacting fields that constitute a radioactive atomic nucleus carry the probability, in any given period of time, of a 'jump' — a transition — to a different configuration. Consider, for example, beta decay. The new configuration will be a different nucleus (the decay product) together with a pulse of probability wave spreading out from it carrying a single quantum (an electron). This, surely, is the 'collapse of the wavefunction' that takes place in Schrödinger's cat experiment, and it clearly has nothing whatever to do with measurement or observation. With this interpretation, Schrödinger's paradox seems to be resolved.

Unfortunately, this viewpoint does not eliminate the paradoxical nature of quantum fields in other situations, as we shall see.

The Non-Locality of Quantum Fields

Consider a pulse of light, carrying only a *single photon*, aimed at a photographic plate. At some undetermined time during the pulse, a spot will appear at some undetermined place on the plate, and *simultaneously* the pulse (i.e. the single-photon probability wave) will vanish. The configuration (consisting of the probability wave and the plate, in interaction) has undergone a transition — 'the wavefunction has collapsed'. This random event has nothing to do with the developing and 'observing' of the plate, in the 'interpretation' we are now adopting — it took place in 'objective reality' while the pulse and the plate interacted. Since the pulse, while it existed, could have been quite extensive, and we have to conceive of it disappearing 'all at once', that is, 'simultaneously', the transition is a *non-local* event. This non-local aspect of quantum theory, when considered more thoroughly, leads to conceptual difficulties that are quite profoundly disturbing. Einstein, in introducing the theory of relativity, taught physicists to be suspicious of the word 'simultaneously' — it is a troublemaker!

To demonstrate more dramatically the conceptual difficulties raised by this non-local aspect of quantum theory, consider a thought-experiment in which a beam of light is aimed at a semi-silvered mirror; half the light is reflected and half is transmitted. Suppose the intensity and duration of the beam is reduced so that we have only a pulse of probability wave carrying a single photon. One might expect the photon to be either reflected or transmitted — with a fifty percent probability

for each of the two possibilities. This can be verified by setting up two photon detectors. Only one of them will register the arrival of a photon. (Penrose's version of Schrödinger's cat experiment⁹ employs this arrangement instead of a radioactive atom: one of the detectors is the poison capsule and the cat.) Note that the detectors can be a considerable distance apart — a few yards or even a few light-years. The puzzling question then is: when the photon strikes one of the detectors, how does the other detector 'know' that this has happened? If the two detectors are at equal distances from the mirror the 'collapse of the wavefunction' — i.e. the vanishing of the probability wave *which is split into two widely separated pieces* — must happen simultaneously at two places far apart.

The theory of relativity tells us that nothing can travel faster than light. If information could be transmitted faster than light this would imply, according to the theory of relativity, the possibility of transmitting information *into the past*, thus violating a fundamental principle of physics known as 'causality'. Causality, simply stated, is the commonsense assertion that 'you cannot change the past.' The absurdities that ensue if you try to imagine the violation of causality have been explored extensively by science-fiction writers.

The principle of causality shows that we cannot account for the reception of the photon at just one of the detectors by imagining some kind of *signal* establishing communication between the different bits of the wavefunction. If the detector that registers the arrival of the photon happens to be further from the mirror than the other detector, such a signal would have to travel into the past when the probability wave collapses.

The paradox deepens when relativity theory steps in and tells us that the question as to which detector receives the probability wave 'first' has in general no absolute meaning. The answer depends on the system of reference, that is, on the state of motion of the 'observer'. The status of the probability wave as an entity with objective existence vanishes.

The alternative explanation, that the probability wave was not split at the mirror but was either wholly transmitted or wholly reflected, is ruled out because, instead of the two detectors we could place two ordinary mirrors to bring the two halves of the pulse together again and demonstrate an interference effect as in Young's double-slit experiment. Thus the single-photon pulse really *is* split at the semi-silvered mirror. The conclusion then must be that the particular kind of event that takes place when the wave interacts with the semi-silvered

mirror would have to depend, not only on events far away, **but on events that have not yet happened.**

The non-local property of ‘collapsing wave functions’ thus gives rise to apparently insurmountable conceptual paradoxes. One of Einstein’s many attempts to refute the quantum theory by demonstrating its absurdity in ‘thought-experiments’ exploited the non-locality in what has become known as the EPR paradox. It was published in collaboration with Boris Podolsky and Nathan Rosen in 1935.¹⁰

There are several variants of the EPR paradox. **The simplest to describe is the version suggested by David Bohm.** Suppose a spinless particle decays, emitting an electron and a positron that move off in opposite directions. They also *spin* in opposite directions (because of the conservation of angular momentum), so **If the spin of one of them is measured, the spin of the other is known.** There would be nothing surprising about this if they were ‘classical’ particles. But **a quantum ‘particle’ such as an electron or a positron does not actually have a spin until its spin is ‘measured’.** A measurement of the spin of an electron involves a *choice* of the axis of spin, and the measurement then reveals whether it is spinning clockwise or anticlockwise *about the chosen axis*. Before the measurement, it can only be regarded as being in a superposition of spin states. Quantum theory then tells us that when you now measure the spin of the positron (which may be a long way away) about a parallel axis, it will be found to be spinning in the opposite sense. We can of course choose two *different* axes (*not* parallel) for the two measurements, and then quantum theory predicts the statistical *correlation* between the two measurements, that will be revealed by a series of such experiments. **Thus the arbitrary choice of axis for one of the measurements influences the outcome of the other.**

The experiment suggested by Einstein, Podolsky and Rosen was similar to Bohm’s thought-experiment but involved a pair of photons spinning in opposite directions instead of an electron and a positron. A photon always spins about its direction of travel as axis, so the details are a little different. Clockwise and anticlockwise spin of a photon correspond to left- and right-circular polarisation. (The electric and magnetic fields that light is made up of have a helical motion.) Various superpositions of these two basic spin states correspond to other states of polarisation. Quantum theory predicts that the polarisation state we *choose* to detect for one of the photons influences the outcome of a polarisation measurement for the other photon, *even though there is no way any kind of signal could pass between the two measuring events*. A series of such experiments would, according to

quantum theory, reveal a kind of ‘action at a distance’, whereby two sets of random events, separated so that no signal could convey information between them, can nevertheless be statistically *correlated*.

These kinds of experiments were only ‘thought’ experiments until 1982, when Alain Aspect¹¹ and his collaborators, using extremely sophisticated equipment, succeeded in actually carrying out the experiments. The polarisation states of vast numbers of photon pairs emitted from mercury atoms were measured. The two photons of each pair were several yards apart at the time of each measurement, and by using timing devices operating at billionths of a second it was arranged for the planes of polarisation to be chosen only *after* the photons had left the atom. *The predictions of quantum theory were confirmed. Einstein was wrong* — the EPR paradox doesn’t ‘refute’ quantum theory. The EPR paradox shows that the principles of quantum theory are conceptually bizarre; Aspect’s experiment shows that *nature is bizarre*.

The weirdness of the mysterious random processes called ‘transitions’ (‘collapse of the wavefunction’) is now revealed. In certain circumstances they can extend over arbitrarily large regions of space and time and involve correlations over those regions that violate the principle of causality. Yet they do so in such a way that all *observations* remain consistent with causality.

The experimental predictions of quantum theory have continued to be resoundingly successful throughout the twentieth century. Yet, no matter how human reason twists and turns in its struggle to come to grips with the implications of the theory and to arrive at a consistent picture of an objective reality beyond ‘observations’, it comes to an impasse. Quantum theory seems always to imply that the actual existence of a ‘physical reality’ underlying observations and giving rise to them is illusory, that the notion of self-consistent ‘reality’ applies, in the final analysis, not to ‘matter’, but only to *acts of observation* — i.e., to the flow of conscious experience, to ‘mind’.

There is perhaps some missing ingredient, some underlying concepts that would lead to a deeper theory of which the present theory is only a manifestation, but such concepts remain tantalisingly elusive. Perhaps Haldane was right when he said

*The Universe is not only queerer than we suppose.
It is queerer than we can suppose.*

— J.B.S. Haldane¹²

Notes and References

1. Wm. Thomson, Lord Kelvin, *Popular Lectures and Addresses*, London 1894.
2. Bordé, Ch.J., Molecular interferometry experiments, *Phys.Lett.*, A188, 1994, p.187; *New Scientist*, 4 Jun. 1994.
3. Schrödinger, E., Die gegenwartige Situation in der Quantenmechanik, *Naturwissenschaften* 23, 1935, pp.807,823, 844. English transl. J.T. Trimmer, *Proc.Amer.Phil.Soc.* 124, 1980, p.323: reprinted in Wheeler & Zurek (eds) 1983.
4. Wigner 1967. See also Gardner, M., Quantum weirdness, in Gardner 1983b,
5. Borges, J.L., The garden of forking paths, in *Labyrinths*, Penguin 1970.
6. Everett, H., 'Relative state' formulation of quantum mechanics, *Rev.Mod.Phys.* 29, 1957, p.454. Reprinted in Wheeler & Zurek (eds) 1983.
7. Harvey, D., The languages of science, *New Worlds*, Oct.1967.
8. In fact, if one considers the implications of quantum theory for the behaviour of the physical world in very short time intervals one is forced to conclude that transitions occur all the time, in bewildering profusion, even in 'empty' space. This is because time and energy are complementary, so that in very short time periods there are large uncertainties in energy. Thus 'virtual' pairs of all kinds of 'particles' can spontaneously appear and disappear, so long as the 'violation' of the principle of energy conservation is brief enough! That this picture is essentially correct is shown by Feynman's quantum electrodynamics, which takes these vacuum fluctuations into account and is remarkable for the precision of its quantitative predictions.
9. Penrose 1989, p.375.
10. Einstein, A., Podolsky, B. & Rosen, M., Can quantum mechanical description of physical reality be considered complete? *Phys.Rev.* 47, 1935, p.777.
11. Aspect, A. & Grangier, P., Experiments in EPR-type correlations with pairs of visible photons: in Penrose & Isham (eds) 1986.
12. Haldane 1927.

5 THE NATURE OF MIND

The Inner World

Every science is a function of the psyche, and all knowledge is rooted in it. The psyche is the greatest of all cosmic wonders and the *sine qua non* of the world as an object. It is in the highest degree odd that Western man, with but very few — and ever fewer — exceptions, apparently pays so little regard to this fact. Swamped by the knowledge of external objects, the subject of all knowledge has been temporarily eclipsed to the point of seeming non-existent.

— Carl Gustav Jung¹

The theories and speculations about the nature of the world, that we have touched upon in previous chapters, are all products of the human mind. Scientific knowledge — or, for that matter, any kind of knowledge whatsoever — consists of mental constructs, internal models, existing in the world of thought and imagination. The inner world of thoughts, images, feelings and memories is, for each one of us, the *primary reality*. We are aware of other aspects of the world only by virtue of their effects on this inner world.

The sights, sounds, tactile sensations and so on that are the constituents of living experience seem to us like direct apprehensions of attributes of objective reality. That, of course, is an illusion; our awareness of things and events is the end-product of complex and subtle information-processing and selection, carried out automatically by the brain's perceptual mechanisms. We understand the meaning of what we perceive only through further *cognitive* processes that make use of prior expectations based on memory of past experience.

The untrustworthiness of this process of acquiring knowledge (because of perceptual distortions, erroneous beliefs, faulty reasoning, etc.) is recognised in common speech, in the use of the words 'real' and 'imaginary' as opposites — as if 'imaginary' were synonymous with 'unreal'. The success of the scientific method is attributable to strategies for guarding against errors in the process of acquiring knowledge. One of these strategies is the adoption of *consensus* as a criterion of reliable knowledge: human beings are able to communicate with each other to establish common features of their individual

conceptual models. Of course, this gives no guarantee against communal misapprehensions about the nature of reality. As we have seen, these are not uncommon and they have an unfortunate tendency to become fixed and impervious to evidence against them. Apparently well-established notions about the nature of reality can turn out to be fundamentally in error.

In view of the fact that our inner mental worlds are our primary reality, it is rather ironic and somewhat paradoxical that in the quest for knowledge it is knowledge about the nature of mind that has turned out to be peculiarly elusive. Concepts arising from the direct experience of what it is like to be a creature with a mind — awareness, attention, volition, various moods and feelings — are strangely difficult to pin down. It is as if we are confronted with a different kind of reality, separate from the objective physical reality that science has so successfully probed.

Imagination makes man's world. This is not to say that his world is a fantasy, his life a dream, or any such pseudo-philosophical thing. It means that his 'world' is bigger than the stimuli that surround him, and the measure of it is the reach of his coherent and steady imagination.

— *Susanne K. Langer*²

Imaginary experience is constitutive of man, no less certainly than everyday experience and practical activities. Although the structure is not homologous with the structure of 'objective' realities, the world of the imaginary is not 'unreal'.

— *Mircea Eliade*³

The Concept of Mind in Philosophy

The moment-to-moment experience of living is constituted of certain processes, by virtue of which we are made aware of things and events. Some of these processes can be described as 'outwardly' directed — the conscious apprehension of sensory impressions — while others, such as thinking, imagining and remembering, are 'inwardly' directed. As well as these 'mental processes' one can identify various 'mental states': feelings, moods, emotions, beliefs and intentions. 'Remembering' refers not only to the recalling to consciousness of past events; it can also refer to the continually active process in the wakeful mind that provides us with the awareness of temporal continuity. It is the process that, for example, enables speech utterances and melodies to be comprehended. Indeed, without this kind of 'remembering' there would be no sense of 'self', no 'experiencing' at all:

Under the expression mental states I am including all our conscious experiences, sensations, feelings, emotions, thoughts and reasonings, doubts, beliefs, desires, volitions and also our memories of these experiences. The fact that we have memories has several consequences: it gives us the consciousness of the temporal succession of events; it allows us to compare present with past experiences; and it permits us to integrate a personality, a mental "I" with a history and some continuity not interfered with by sleep and other periods of unconsciousness.

— Arturo Rosenblueth ⁴

Mind is the complex phenomenon that encompasses all the 'conscious' mental processes and states and includes all 'unconscious' processes and states that can be inferred to exist from their influence on the contents of consciousness and on overt behaviour.

The relationship between mental processes and states and the physical world they apprehend remains mysterious. The problem of elucidating the mystery is the 'mind-body' problem — the central problem of philosophy. Could its curiously self-referential nature — mind attempting to explain itself to itself — be a hint that it is inherently insoluble?

Whenever we can reach agreement about physical phenomena we call our conclusions 'objective'. They are public statements about the physical world and they refer to 'primary' properties of its objects. On the other hand, one person's mental states and mental processes are not accessible to the observation of others. Mental states and mental processes are consequently referred to as 'subjective'. Properties of the mental sensations that are brought to awareness by perception are referred to as 'secondary' properties of perceived objects (for example, the frequency and intensity of sound-waves produced by a violin string are primary/objective properties; their pitch and loudness — the mental sensations they give rise to — are secondary/subjective).

The secondary world of sensory experience is what each one of us directly apprehends. The primary world of 'objective reality' is an inferential construct postulated to account for it. This primacy of the so-called secondary reality gave rise to the extreme philosophical position known as *mentalistic monism*, which asserts that the objective physical world is dependent for its existence on its apprehension by conscious minds. This view seems to be implicit in the philosophy of Plato, and was taken up again by Hegel and Bishop Berkeley. Under the name *Idealism* it became popular among nineteenth-century English

philosophers. Though seemingly absurd, there appears to be no logical or empirical argument that would refute it (Dr. Johnson, in conversation with Berkeley, is said to have kicked a stone into the air, declaiming 'I refute it thus!'). A more recent proponent of Idealism has been the theoretical physicist John A. Wheeler.⁵ Basing his argument on extrapolation from Wigner's ideas about the role of consciousness in 'observation', Wheeler went so far as to suggest that the whole past evolution of the universe might somehow be brought into existence retro-actively by the acts of observation of conscious minds.

The idea that the fundamental reality underlying the physical world might be closer to the concept of 'mind' than to that of 'matter' has been expressed by various early twentieth-century physicists, most notably Sir Arthur Eddington and Sir James Jeans.

The 'mind-body' problem consists of two intimately linked but conceptually quite distinct problems. As well as the problem of understanding the relationship between minds and the world they apprehend, there is the problem of understanding the relationship between mental processes and the concomitant neurophysiological processes taking place in the brain. The *psychoneural identity thesis* is the name given to the assertion that the problem simply does not exist — mental processes and brain processes are the same thing; having a particular subjective experience is 'nothing but' being in a particular physiological condition, and mental activities are just the activities of the brain. The trouble with this notion is that it leads to no real insight. It is a pseudo-solution. It can be argued that it arises from a misunderstanding of what the mind-body problem actually *is* (it is a tantalisingly difficult problem to pose with the imprecise tool of human language — the only tool that philosophy has). Discussions of neurophysiological processes and discussions of everyday conscious experience involve two different conceptual categories, and the distinction *seems*, at least, to be immense. Moreover, only certain kinds of brain activity have concomitants in conscious mental activity and it is not at all clear what distinguishes them in neurophysiological terms. The problem consists of undeniable facts of this kind, that cry out to be understood. No problem is ever solved by sweeping it under the rug and hoping it will go away.

Behaviourism is the name given to the even more extreme view that minds and mental processes have no real existence. To most people it would seem inconceivable how such a view could have arisen in the minds of otherwise intelligent people. Later on we shall look at behaviourism and how it arose, because it admirably illustrates how rationality can be distorted and used as a support for tenaciously-held beliefs.

The psychoneural identity thesis can be regarded as a clumsy expression of the view presented more cogently in *psychophysical parallelism*. This cumbersome term denotes the philosophical stance that accepts the dichotomy between neurophysiological processes and mental (psychological) processes, but insists that every mental state is correlated with a corresponding neurophysiological state and that every mental process is correlated with a corresponding neurophysiological process. Thus mental processes and brain processes ‘run parallel’. This view underlies some of the writings of Spinoza.

The deficiency of psychophysical parallelism is its avoidance of the question of any causal relationship between mind and brain. A precise correlation between two categories of phenomena calls for an explanation — the need to understand the *reason* for the correlation arises. Several possibilities suggest themselves:

Epiphenomenalism regards every ‘mental’ concept as having, in principle, an underlying causal explanation in terms of brain activity. In other words, mind in all its aspects is an expression of brain activity — an epiphenomenon. This view was expressed by Hobbes and has been attributed to him, but it was clearly expressed much earlier:

Men ought to know that from the brain and from the brain only arise our pleasures, joys, laughter and jests as well as our sorrows, pains, griefs and tears... It is the same thing which makes us mad or delirious, inspires us with dread and fear, whether by night or by day, brings us sleeplessness, inopportune mistakes, aimless anxieties, absent-mindedness and acts that are contrary to habit...

— *Hippocrates* (c.460 - c.377BC) ⁶

In combination with the conception of the brain as a strictly deterministic mechanism, epiphenomenalism leads logically to a rejection of the concept of free will (or ‘volition’ or ‘intentionality’ — whatever you want to call it). This is quite startling, since free will is no mere philosophical abstraction: it is the basis of ethics and morality — it is the idea that persons are *responsible* for what they do.

...Thus one successively makes men accountable for the effects they produce, then for their actions, then for their motives, and finally for their nature. Now one finally discovers that this nature, too, cannot be accountable, in as much as it is altogether a necessary consequence and assembled from the elements and influences of things past and present: that is to say, that man can be made accountable for

nothing, not for his nature, nor for his motives, nor for his actions, nor for the effects he produces. One has thereby attained to the knowledge that the history of the moral sensations is the history of an error, the error of accountability, which rests on the error of freedom of will.

— Friedrich Nietzsche⁷

Various philosophers have put forward arguments purporting to reconcile free will and determinism. An amusing, but at the same time highly thought-provoking ‘compatibilist’ argument is Raymond Smullyan’s ‘Is God a Taoist?’, presented in the form of a dialogue between a Mortal and his God.⁸ Since what is ordinarily meant by ‘free will’ is obviously *logically* incompatible with what is ordinarily meant by ‘determinism’, it follows that any compatibilist argument must be some kind of verbal quibble about the meanings of these terms. But more of this later.

Dualism denotes a range of philosophical views that accept the apparent dichotomy presented by the mind-body problem at its face value — as indicative of an actual dichotomy in the real world. It is then a question of elucidating the nature of the interaction between mental and physical phenomena. A dualistic philosophy is thus one that admits a two-way causal nexus, with mental activity having some role in directing brain activity. Since anything with a causal role in the physical world is, *ipso facto*, physical, it has been argued that dualism is thereby rendered untenable. This is not the case: dualism implies that some concept that we are in the habit of regarding as a mental concept is in fact physical — or, rather, that it belongs to both categories — a ‘psychophysical’ concept. In a later chapter we shall examine the hypothesis that *consciousness* may be a concept of this kind.

Consciousness is admittedly hard to define objectively, but each of us has a clear, intuitive understanding of what he means by being conscious... In claiming that biology is not likely to be a branch of the present physics, I do not wish to imply that life can in some way evade the laws of physics... It is at least possible, and to me probable, that new... concepts have to be added to our present physical ones before an adequate description of life is possible. Whether the thus enlarged discipline should still be called physics is a semantic question.

— Rudolph Peierls⁹

An observed correlation between two phenomena is accounted for if one can be identified as the cause, the other as the effect. But an alternative possibility should not be forgotten: **there may be a third thing, that causes both.** William James proposed that the ‘stuff’ of which the world is constituted **is neither mind nor matter, but something more fundamental, of which both are manifestations.** This view has been adopted and developed by Bertrand Russell. **In *The Analysis of Mind* Russell expounds the view that the elementary constituents of the world (which he calls ‘particulars’) are neither mental nor physical, but through their various combinations and relations give rise to what we call ‘mental’ and ‘physical’ phenomena:**

Idealists, materialists and ordinary mortals have been in agreement on one point: **that they knew sufficiently what they meant by the words ‘mind’ and ‘matter’ to be able to conduct their debate intelligently.** Yet it was just in this point, as to which they were at one, that they seem to me to have been all alike in error.

The stuff of which the world of our experience is composed is, in my belief, neither mind nor matter, but something more primitive than either. Both mind and matter seem to be composite, and the stuff of which they are compounded lies in a sense between the two, in a sense above them both, like a common ancestor...

It is probable that the whole science of mental occurrences, especially where its initial definitions are concerned, could be simplified by the development of the fundamental unifying science in which the causal laws of particulars are sought, rather than the causal laws of those systems of particulars that constitute the material units of physics.

— *Bertrand Russell*¹⁰

A similar concept is to be found in the writings of Spinoza, who posited a single ‘substance’ which could be regarded, according to the point of view taken, as both ‘thinking’ and ‘non-thinking’. Wilhelm Wundt¹¹, Ortega y Gasset and Jung have expressed somewhat similar views:

According to Wundt, phenomena as such are neither mental nor material. **Every phenomenon... exhibits a two-fold nature of being subjective and objective.** Strictly speaking, we could not even say that much, for subjectivity and objectivity are

determinations resulting from an effort of abstraction: they are the fruits of a theoretical endeavour. For Wundt, however, a phenomenon is a way of being which is prior to any distinction; it is reality given in its original correctness and fullness. The so-called physical world is a constructed world, a world resulting from abstraction, a mediated world, while reality is given to us.

— *Ortega y Gasset* ¹²

Since psyche and matter are contained in one and the same world, and moreover are in continuous contact with one another and ultimately rest on irrepresentable, transcendental factors, it is not only possible but fairly probable, even, that psyche and matter are two different aspects of one and the same thing.

— *C.G. Jung* ¹³

It is natural for the human mind to seek unification in its quest for understanding. But this cannot be forced. Dichotomies rightly belong to a particular stage of understanding. My own view is that it is appropriate to speculate in terms of ‘mind’ and ‘matter’, ‘mental’ and ‘physical’, ‘subjective’ and ‘objective’, and so on, until such time as the unitary ‘psychophysical’ nature of reality is better understood, and that time is not yet come. The presently dominant ‘materialistic monism’, with its assertion that mind is an epiphenomenon to be explained (or ‘explained away’) in terms of strictly mechanistic processes, provides a *simulacrum* of unified understanding but seems to me to fail to get at the root of the mind-body problem. The true unification — a proper understanding of the ‘psychophysical’ nature of reality — may be strange and subtle in ways we cannot imagine. Until that level of knowledge is reached (if it ever can be), I feel that some kind of dualistic framework, as a provisional heuristic hypothesis, is a valid and fruitful viewpoint.

Myself when young did eagerly frequent
Doctor and Saint, and heard great Argument
About it and about, but evermore
Came out by the same Door as in I went.

— *Omar Khayyam (tr. Edward Fitzgerald)* ¹⁴

Behaviourism

Psychology is the scientific investigation of mental processes. Behavioural psychology is the science that starts from the premise that mental states and mental processes are not legitimate subjects for scientific investigation. Let us consider how this paradox came about.

Psychology strives to be a science. That is, it attempts as far as possible to apply scientific methods to the study of the mind. Now, one of the tenets of the scientific method, that has proved invaluable and indispensable in other branches of science, is that experiment and observation should ideally be *objective*. For psychology, this is a major stumbling-block. The investigator who, by introspection, attempts to draw conclusions about his own mental processes, can only come up with conclusions that are, necessarily and by definition, *subjective*. Added to this is the further difficulty that the direct observation of mental processes in another human subject, or a non-human subject, is not possible. All that can be objectively observed is the effect of mental events, manifested in the behaviour of the subject.

These considerations lead to the formulation of a methodology: behavioural psychology restricts itself to the study of behaviour in humans and animals, and avoids reference to mental processes in its modes of description and explanation. Introspection is ruled out as a procedure for obtaining psychological information — it is not objective and therefore ‘not scientific’. The originator of this approach to experimental psychology was J.B. Watson.¹⁵ In his own words:

The time has come when psychology should discard all reference to consciousness, and no longer delude itself into thinking that it can make mental states the object of observation.

— J.B. Watson ¹⁶

(He seems not to have noticed that ‘delude’ and ‘thinking’ refer to mental processes...).

Behavioural psychology, in spite of its severe self-imposed limitations, has provided a great deal of knowledge about patterns of behaviour; as a scientific methodology it has not been without some success. For example, it has given insights into the role of conditioned reflexes in the learning of skills (Watson was the originator of the term ‘conditioned reflex’). Its success is particularly surprising when one realises that actual experiments in behavioural psychology tended to be even more restricted than they needed to be. For example, many of the experiments performed by B.F. Skinner, the most eminent proponent of

behavioural psychology, consisted of observations of rats or pigeons in cages, pressing levers to obtain food. The point of this seems to be that the results were readily *quantifiable*, and *ipso facto* unarguably soundly 'scientific'. On the basis of the results, Skinner felt justified in extrapolating to sweeping generalisations about the behaviour of humans in the complex environment of human society.

To the uninitiated it might seem that, since speech is a prominent feature of human behaviour, it might be permissible to obtain information about the mental processes of human subjects by the simple expedient of asking them about the thoughts and feelings associated with their behaviour. But this was ruled out; it is only 'introspection' at second hand, and so not admissible.

The belief that only what is objectively observable and quantifiable is a legitimate concern of science seems to have arisen from the view that physics is the paragon of sciences, and that, therefore, all the sciences — including psychology — would do well to adopt strategies patterned on those of physics. The fallacy in the stance taken by the behavioural psychologists lay in its naive view of physics as a science dealing exclusively in objective measurement of quantifiable phenomena. This view of physics is a feeble caricature; physicists don't just measure and observe, they also ask 'why?' The success of physics is not attributable simply to objectivity and quantifiability. It comes from the employment of *imagination* in the construction of models and hypotheses, that lead to insights into the reality underlying the observation of measurable quantities. Had the behavioural psychologists understood this, their attempt to give psychology respectability by adopting the strategies of physical science would have led them to recognise mental states not only as legitimate, but as *necessary* concepts without which observations of human and animal behaviour remain superficial and unintelligible.

Skinner's rejection of the need for models underlying processes is curiously like Babylonian astronomy right at the start of science — which provided systematic observations but which did not give any account of what might lie behind or produce the observed phenomena.

— Richard L. Gregory¹⁷

Behaviourism is a philosophical position derived from behavioural psychology. It asserts not only that mental processes lie outside the legitimate concerns of science but that, because they lack 'scientific validity', they have *no real existence*. According to Skinner,

for example, mind, ideas, consciousness, and so on are non-existent entities 'invented to provide spurious explanations':

Since mental or psychic events are asserted to lack the dimensions of physical science, we have an additional reason for rejecting them.

— *B.F. Skinner*¹⁸

There is a superb irony in the fact that statements of this kind are products of the *minds* of the behaviourists who made them. What would have happened in physics if physicists had taken this kind of attitude? The atomic theory would never have developed. It would have been argued that atoms are not directly observable and therefore outside the legitimate concerns of science — non-existent entities 'invented to provide spurious explanations.'

Behaviourism was a fashionable stance in the psychological sciences for a surprisingly long time and has now waned. We have dwelt on it at some length here because it provides a particularly striking example of how scientific methodologies, along with their self-imposed limitations, can degenerate into dogmatic belief systems that sometimes become ludicrous in their rejection of facts that do not fit in.

Skinner gradually came to realise the inadequacies of the extreme form of behaviourism. His book *About Behaviourism* is a definitive exposition of his later beliefs. It is clearly meant as a defence of behaviourism against accusations of superficiality. Skinner considered various statements of the kind that refer to 'mentalistic' concepts such as intentions, purposes, ideas and feelings and contrived to show how they can be reformulated in the language of behaviouristic jargon. However, his implication that the behaviouristic formulations 'explain' the mentalistic concepts remains far-fetched and unconvincing. The contrary view, that mentalistic concepts explain behaviour is just as tenable. Skinner offered no reasoned arguments to show why this 'common sense' view should be rejected in favour of his topsy-turvy reinterpretations.

Dualism

Dualistic philosophical systems regard the world as constituted of two essentially distinct kinds of phenomena, the physical and the mental. The earliest clearly-presented dualistic philosophy was that of Anaxagoras, who lived in the fourth century BC. He perceived that the world operated on essentially mechanistic principles and conceived of Mind as that which controls and organises Matter, bringing order out of chaos. In the dualism of Anaxagoras, therefore, Mind is a universal

organising principle that includes, but is much more than, the minds of human beings and animals.

Cartesian dualism arose at a time when classical physics had established much more precisely the mechanistic laws governing the world of matter. The central philosophical problem had become that of **understanding the status and role of human minds in a mechanistic material universe**. Descartes regarded the faculty of *speech* as the hallmark of mind. His assertion that **minds do not work on mechanistic principles** — and therefore that mind and matter are essentially distinct — was based on his conviction that no conceivable mechanical device could possibly employ speech in the way human beings do:

For we can easily understand a machine's being constituted so that it can utter words, or even emit some responses to action on it of a corporeal kind... for instance, if it is touched in a particular part it may ask us what we wish to say to it; if in another part it may exclaim that it is being hurt, and so on. But it never happens that it arranges its speech in various ways, in order to reply appropriately to everything that is said in its presence, as even the lowest type of man can do. And the second difference is, that although machines can perform certain things as well or perhaps better than any of us can do, they infallibly fall short in others, by which we may discover that **they did not act from knowledge but only from the disposition of their organs**. For while reason is a universal instrument that can serve for all contingences, those organs have need of some special adaptation for every particular action.

— *René Descartes*²⁰

We see here another instance of **the danger of drawing far-reaching conclusions from the current state of human knowledge**. Descartes, living when he did, had a limited conception of the potential capabilities of machines. **Developments in computer technology now taking place seem to indicate that the idea of a machine capable of using human language competently**, though not yet achieved, is not at all as self-evidently impossible as it seemed to Descartes. Nevertheless, the fact that Descartes chose a fallacious argument cannot be taken as a refutation of Cartesian dualism!

Descartes' identification of the faculty of speech as the essential criterion for the existence of mind is a curiously persistent notion. **There is still a widespread belief that linguistic skill is not only a means of communicating our thoughts to each other, but also a**

necessary prerequisite for the *existence* of thoughts. This belief led Descartes to conclude that, since animals do not possess language, they do not think — they are mindless automatons. A kind of anthropocentric arrogance lies at the root of this belief. Even the slightest familiarity with the behaviour of highly-evolved animals — apes, dogs, cats, horses etc. — is sufficient to convince anyone but an adamant behaviourist that they have mental processes. It is also easy to cite instances of non-verbal mental activity of the most highly developed kind — that engaged in by musicians, carpenters, architects, artists, mathematicians, when they are *doing their work*, rather than when they are discussing it:

The words of the language, as they are written or spoken, do not seem to play any role in my mechanisms of thought. Conventional words or other signs have to be sought for laboriously at a second stage.

— *Einstein*²¹

The work grows; I keep on expanding it, conceiving it more and more clearly until I have the entire composition finished in my head though it may be long... It does not come to me successively, with the various parts worked out in detail, as they will be later on, but in its entirety that my imagination lets me hear it.

— *Mozart*²²

[Henry Moore thinks of a sculpture], whatever its size, as if he were holding it in his hand; he mentally visualises a complete form from all around itself; he knows while he looks at one side what the other is like; he identifies himself with its centre of gravity, its mass, its weight; he realizes its volume, as the space that the shape displaces in the air.

— *Herbert Read*²³

Even creative mental activity whose final expression is composed of words may be to a large extent *non-verbal* activity:

The special kind of excitement, the slightly mesmerised and quite involuntary concentration with which you make out the stirrings of a new poem in your mind, then the outline, the mass and colour and clean final form of it, the unique living reality of it in the midst of the general lifelessness, all that is

too familiar to mistake. This is hunting and the poem is a new species of creature, a new specimen of the life outside your own.

— Ted Hughes ²⁴

In recent decades the majority of philosophers, scientists and psychologists seem to have rejected any kind of dualism in favour of the hypothesis that *all* aspects of mind are attributable to brain activity and have no autonomous function apart from the mechanistic functions of the brain. Among notable exceptions are Sir Karl Popper and Sir John Eccles, who presented the case for dualism together with experimental findings in neurophysiology which, they claimed, supports it. Their jointly-authored book has the intriguingly dualistic title *The Self and Its Brain*.²⁵ The writings of such modern dualists invariably become the targets of severe critical attack from the supporters of the majority view.

The modern version of dualism identifies *consciousness* as the quintessentially non-material aspect of mind. To an impartial observer, the arguments put forward by neither side in the dualist/materialist controversy appear convincing. We are faced with opinions, not facts: dualists believe that the idea of *conscious* mechanistic arrangements of matter is absurd; materialists, on the other hand, believe that dualists are absurd. Neither side is able to say what *precisely* is being asserted. ‘Consciousness’ is the quintessence of all experience and knowledge of the world, without which there *could be* no such thing as experience or knowledge. Yet attempts to define ‘consciousness’ intelligibly and to elucidate the nature of its relationship to the rest of the world seem always to encounter some fundamental limitations of thought:

The real mystery pertaining to mental activity is the fact that the mechanism of the brain is accompanied by the phenomenon of consciousness. The human brain is not solely an intricate piece of machinery. Its multitudinous actions and reactions are accompanied by a subjective awareness of pain, fear, pleasure, hunger, sense of effort, drowsiness or excitement, together with a number of other sensations that we call seeing, hearing, feeling, tasting and smelling and which we experience when certain stimuli reaching us from outside are ‘transmitted’ to the brain. In a word, the mechanism of the brain possesses what no other mechanism possesses — the faculty of consciousness or subjective awareness. The phenomenon of consciousness is an enigma which modern science sees little hope of ever resolving — for how

can conscious thought ever hope to explain itself to itself? Consciousness is the one great fundamental fact of our existence beyond which we cannot explore; any 'explanation' of it would have to be made in terms yet more fundamental; and there are none available. Any explanation of consciousness itself would be only a part explanation with at most a limited pragmatic value. There are limits to potential knowledge and the intrinsic nature of consciousness is one of them.

— D.H. Rawcliffe ²⁶

It is of course the elusiveness and mysteriousness of 'consciousness' as a concept — its ineffability — that supports the dualist belief. On the other hand, the same elusive quality provides materialists with the ammunition for their attacks — it makes it all too easy for the materialist to accuse the dualist of occultism, superstition, or simply woolly thinking.

Ernst Nagel²⁷ — who takes a neutral stand on the dualist/materialist issue — has made the following significant point: the methods that science adopts for understanding the physical world proceed away from *subjective* experience — the data provided by perception — towards *objective* statements. The direction is away from our specifically human viewpoint towards more accurate and more reliable knowledge of physical things and phenomena. But, when applied to the phenomenon of consciousness, this strategy for acquiring knowledge makes no sense; how on earth could abandoning our subjective viewpoint in favour of objective descriptions and explanations be any help in furthering our understanding of *the basis of subjective experience*?

It could be an intrinsic attribute of 'consciousness', that it 'surpasses all understanding':

Wovon man nicht sprechen kann, darüber muss man schweigen.

(Whereof one cannot speak, thereof one must be silent.)

— Wittgenstein ²⁸

Free Will versus Determinism

The deterministic reductionism that asserts that mind is an epiphenomenon of brain activity, that brains are computers, and that human beings and other animals are, therefore, simply superbly sophisticated automata, is a belief that exerts a strong hold over the minds of its adherents. The attraction seems to lie in its simplicity and

conceptual clarity — it admits only one kind of reality, *physical* reality, and only one valid explanatory principle, namely *mechanism*. From the point of view of its believers, any opposition can be conveniently dismissed as delusion or superstition. It is amusing, and revealing, that Hofstadter, in referring to the arguments against his particular brand of deterministic reductionism, speaks of ‘the antireductionist *sentiment*.’²⁹

Now in psychology, and indeed in every branch of science or philosophy, this insistence on exclusively materialistic concepts is not, as its champions suppose, the logical outcome of observational evidence adduced in its support: it is rather the effect of a strong subjective preference for a simple and unified scheme which can be expressed in terms of what is palpable and readily visualised.

— Sir Cyril Burt³⁰

A perennial preoccupation of philosophers is the question of Free Will versus Determinism. ‘Free will’ is the name given to the deep-rooted conviction that we are responsible for our actions, that we have some degree at least of conscious control over what we do:

Whatever one’s philosophical convictions, in everyday life it is impossible to carry on without the implicit belief in personal responsibility; and responsibility implies freedom of choice. The subjective experience of freedom is as much a given datum as the sensation of colour, or the feeling of pain.

— Arthur Koestler³¹

The two aspects of human freedom on which I would lay most stress are *responsibility* and *self-understanding*. The nature of responsibility brings us to the well-known dilemma which I am no more able to solve than hundreds who have tried before me. How can we be responsible for our own good or evil nature? We feel that we can to some extent change our nature; we can reform or deteriorate. But is not the reforming or deteriorating impulse also in our nature? Or, if it is not in us, how can we be responsible for it? I will not add to the many discussions of this difficulty, for I have no solution to suggest. I will only say that I cannot accept as satisfactory the solution sometimes offered, that responsibility is a self-contradictory illusion. The solution does not seem to fit the data. Just as a theory of matter has to correspond to our perceptions of matter so a theory of the human spirit has to correspond to our

inner perception of our spiritual nature. And to me it seems that responsibility is one of the fundamental aspects of our nature. If I can be deluded over such a matter of immediate knowledge — the very nature of the being that I myself am — it is hard to see where any trustworthy beginning of knowledge is to be found.

— A.S. Eddington ³²

The assertion that we are ‘simply automata’ has about it something repellent to many people. It calls forth an irrational response, a ‘gut feeling’ that it can’t be right. This kind of response can be dismissed as nothing more than injured pride; it has much in common with the outcry against Darwin’s *Descent of Man*. Those who accept the idea that we are automata contend that, rather than denigrating human beings and their achievements, they are showing us a wonderful thing: our notions about the potential capabilities of machines has been naive; the new belief system is actually a source of awe, wonder and delight that automata *such as we are* can exist.

However, the really disturbing aspect of the reductionist belief is its uncompromising view of the whole of human thought and action as a *strictly deterministic* process. The logical implications, if the reductionist view is correct — and the arguments favouring it are not easily dismissed — lead to an extreme form of nihilism. Earlier forms of reductionism have presented a picture of a blind, indifferent, mechanistic Nature, a backdrop against which human concerns are reduced to relative insignificance — significance and meaning in human affairs are revealed to be human artifacts; we are free to invent and impose meaning so that life comes to have meaning *for us* even when the idea of any cosmic significance in human life has been discarded along with the traditional (theological) paradigm that upheld it. This is the existentialist view. But the world of *deterministic* reductionism is yet bleaker; even our thoughts and our actions, it seems, have now been incorporated into ‘blind, indifferent Nature’. A world in which we are conscious automata with strictly deterministic behaviour reduces the concept of ‘free will’ to the level of a delusion. We are, in this world view, not even initiators of our own thoughts or choosers of our purposes and actions. The idea that we are responsible for our thoughts and actions — the idea that is the basis of morality and ethics and, indeed, the basis of all meaning in human affairs — becomes part of a system of delusions. We have no more ‘freedom of action’ than has a pebble swept along by a stream.

For science destroys the concept of personality by reducing it to a complex in flux from moment to moment — that is to say, it destroys the very foundation of the spiritual and emotional life, which ranges itself unyieldingly against reason.

— *Miguel de Unamuno*³³

If one is convinced by the arguments supportive of deterministic reductionism, the conclusion is logically inescapable. Of course, the unpleasant implications of a philosophical position do not serve to refute it. If the world view it presents is ‘the truth’, one has to accept it — to accept that the scientific quest, the striving to make sense of the world that we experience, has revealed a world of meaningless and pointless activity that, in the final analysis, doesn’t ‘make sense’ at all. The strange thing is that those who do accept such a view unreservedly as the truth appear, in general, to accept it cheerfully. How do they account for that?

An answer lies in arguments purporting to reject the idea that determinism and free will are incompatible. Arguments for ‘compatibilism’ are not new; they occur in the writings of Hobbes, Hume and Kant. The subsequent introduction of the idea that ‘the brain is a computer’ lends more specificity to the notion that determinism underlies human actions, but the essential nature of the compatibilist arguments have not substantially changed. In recent decades, the eminent Oxford philosopher A.J.P. Kenny has been a leading proponent of the compatibilist position.³⁴

Suppose that our brains are, in fact, ‘nothing but’ computers. It is clear, even from the capabilities of computer programs that already exist, that computers are capable of making autonomous decisions. A chess program, for example, explores the future consequences of various courses of action, assesses them, and adopts the strategy that is most likely to achieve its *purpose* — its purpose being, of course, to win the game. Hence, it can be argued, a point of view that asserts that mental processes are deterministic does not at all negate the possibility of *purposiveness* in thought and action. One can then proceed to argue that free will is not at all rejected when we adopt a deterministic explanation of mental action; the belief that it is comes from the mistaken idea that we can conceptually separate ‘ourselves’ from the deterministic processes that are our thoughts and actions; it is nonsense, according to the ‘compatibilist’, to maintain that we are *constrained* to think and behave as the mechanistic processes of our brains dictate, for the simple reason that *we are those processes*.

Compatibilist arguments, of which the one sketched above is typical, all avoid the real problem. Can a computer be said to be

‘exercising free will’ when it makes a decision? It cannot. **Decisions made by computers**, although they may be extremely subtle decisions based on complex procedures for testing strategies to achieve goals, when viewed with hindsight, **are inevitable decisions**. A computer’s decision is always a *unique* consequence of the internal state of the computer system, including data in its memory, at the time of the decision. The decision is *determined* by these things. A different outcome from the actual outcome was never in reality possible. This kind of inevitability is implicit in the meaning of ‘determinism’. **Free will, on the other hand, implies the possibility of genuinely alternative actions**. It implies that when, having followed a course of action, we look back and say that *we could have acted differently*, that is *in fact* the case! Either free will is that, or it is nothing.

The compatibilist argument was expressed by Planck as follows:

The existence of strict causality implies that the actions, the mental processes, and especially the will of every individual are completely determined at any given moment by the state of his mind, taken as a whole, in the previous moment, and by any influences acting upon him coming from the outside world. We have no reason whatever for doubting this assertion. But the question of free will is not concerned with the question whether there is such a definite connection, but whether the person in question is aware of the connection.

— Max Planck ³⁵

Because of the unusual clarity of Planck’s statement, the flaw in the compatibilist argument is easily discernible: the only ‘free will’ that is ‘compatible’ with determinism is the *illusion* of free will — the subjective impression that we have free will.

Sir Karl Popper has argued that it is impossible *even in principle* for any mechanistic (i.e. deterministic) device to predict in detail its own future action, since the self-referential nature of such an idea would encounter logical paradox.³⁶ D.M. MacKay refers to this as a ‘principle of logical indeterminacy’, that can arise even in a completely mechanistic universe, and relates this principle to the ‘free will’ exercised by the brain’s cognitive mechanisms, through the self-referential nature of the processes of forming beliefs and making decisions about our future actions.³⁷ MacKay’s arguments are subtle, but in essence they do not differ from Planck’s straightforward statement. The fallacy, like the fallacy of all ‘compatibilist’ arguments, comes from mixing up the concept of ‘determinacy’ with the concept of

‘predictability’. The fallacy is revealed by the contradiction that arises when the word *indeterminacy* is used to describe a feature of a *deterministic* universe.

The conclusion is inescapable. We are left with only two logically incompatible alternatives: *either* all our thoughts, fears, desires and actions are simply agitations of matter, as automatic, uncontrolled and pointless as any *inanimate* phenomenon, *or* there is something fundamentally wrong with the notion of strictly deterministic causal laws as the only principles underlying brain action.

The Status of Reductionism

Earlier in this chapter, we briefly considered the dualistic world view that regards mind, or at least certain aspects of mind, as being essentially different in kind from the material aspects of the world revealed by the physical sciences, and not reducible to or explicable in terms of them.

We also considered the contrary, reductionist, view which later came to dominate and, apparently, relegated dualism to the status of a discarded historical curiosity. The reductionist view is at present so firmly entrenched that, in much current discussion in psychology, philosophy and neurophysiology, **it is generally taken for granted that materialistic explanations of mental phenomena are the only basis for rational discussion**. Embedded in this materialist outlook is the even more severe implicit assumption — or corollary — that the basis of thought and behaviour is *deterministic*.

We have just seen how this materialistic reductionism comes into conflict with concepts that arise directly and naturally from our subjective experience as living organisms — **concepts that lie at the root of the meaning we find in our lives, such as freedom of thought and action and our responsibility for our actions**. The reductionist viewpoint **necessarily relegates these concepts to the status of delusions and misunderstandings**. The situation seems familiar; the reductionist conviction that consciousness is an irrelevance and free will an illusion is reminiscent of Galileo’s dismissal of the moon’s action on the tides as an ‘occult fancy’.

The strict determinism that creates this conflict is a descendant of the nineteenth-century view of the nature of the physical world. The modern reductionist paradigm is a curious hybrid that presents us with a picture of the world in which human thought and action are deterministic, but the behaviour of an electron is not!

Contrary to the dominant ‘scientific’ opinion, **the supposition that brain activity — or, indeed, more general phenomena associated with living organisms — may involve principles that are at present unknown to physical science, is not an *irrational* belief**. Nor is it

refuted by what is at present known. It is important to recognise that the so-called ‘laws of nature’ discovered by the physical sciences are *observed regularities*, not *logical necessities* like the laws of arithmetic. They have been deduced largely from studies of non-living systems, and nothing warrants the extrapolation involved in conjecturing that they are *sufficient* to account for all the phenomena associated with life and mind.

We have already looked at how the (essentially deterministic) laws of classical physics, deduced from the study of large-scale physical systems, fail to apply in the subatomic realm. New principles, based on the concept of undetermined chance events, had to be evolved. The new principles do not conflict with the older principles of classical physics, they supplement and incorporate them. Similarly, it is at least *possible* that a proper account of life and mind will require the discovery and application of new principles that will not contradict but supplement the presently known principles governing inanimate matter. Of course, if the concepts associated with ‘freedom of action’ are to take their place in a new scheme of understanding, the determinism of classical physics and the probabilistic ‘laws of chance’ would have to be superseded by a radical re-evaluation of current notions of cause and effect. This would entail severe conceptual and philosophical difficulties. But, as we have seen, the example of quantum theory demonstrates quite clearly that even apparently insurmountable conceptual difficulties do not necessarily invalidate a scientific theory!

Incidentally, the abandonment of deterministic reductionism in the science of brain and mind wouldn’t necessarily entail the abandonment of ‘psychoneural identity’ or ‘psychophysical parallelism’; non-deterministic principles underlying the brain/mind phenomenon would not *necessitate* the adoption of a dualistic world view.

Of course, the mere possibility that the conceptual foundations of the framework of scientific thinking *may* yet again change, as drastically as they did when quantum theory and relativity came along, is no reason for actively seeking such a change until we are forced to do so by evidence of its necessity. Materialistic reductionists argue that their methods of acquiring knowledge have worked exceedingly well up to now and that there is no compelling evidence to indicate a need to abandon their beliefs. Indeed, they see in such suggestions a danger of opening the floodgates to wild speculation unsupported by properly substantiated facts. Attempts at systematisation inadequately supported by observational and experimental facts have, in the history of human thought, led to an enormous quantity of barren ‘philosophical’ and ‘metaphysical’ speculation and the construction of elaborate,

dogmatically-stated ‘systems’. Materialist reductionists see, in any opposition to their beliefs, **more than a hint of the kind of pseudoscientific thinking that poses a threat to the intellectual rigour of the scientific spirit**. They, therefore, call into question the quality of any evidence put forward to refute their world view and proceed to debunk it — that is, to ‘explain it away’. I would agree with them *up to a point*. Their world view has the merit of extreme conceptual clarity; on the principle of Occam’s razor³⁸ it would be unwise to introduce new speculative hypotheses **unless there is sufficiently strong evidence that they are needed**, particularly if they bring with them awkward conceptual problems.

My contention is that there *is* abundant evidence that **the world view presented by materialistic reductionism is inadequate**, and that this evidence is swept aside or ignored by those who hold ‘orthodox’ scientific opinions, *for that reason*. I shall have more to say about the ‘quality’ of that evidence as we proceed. I have already drawn attention to the inadequacy of the orthodox (materialist reductionist) paradigm in its attempt to explain the evolution of life solely on the basis of fortuitous random events.

A Reappraisal of Dualism

I have discussed the methods that science has evolved for investigating the *physical world* and formulating concepts and principles to account for its observed modes of action. It is useful at this stage to adopt the term ‘**psychic world**’ to encompass the concepts encountered when mental phenomena are investigated and discussed. As we have seen, the very great qualitative difference between these two conceptual categories — **the physical and the psychical** (or ‘mental’) — gives rise to arguments for and against the notion that the psychic world is wholly a consequence of physical processes — an epiphenomenon. Whatever one’s beliefs on this question, it is undeniable that **discussion of the world in terms of two correlated aspects of reality is valid and useful** — and perhaps indispensable. A devout ‘materialistic reductionist’, for example, will tell you what he ‘thinks’, ‘feels’ and ‘believes’. Even Skinner, the proponent of the view that minds don’t really ‘exist’, came eventually to a grudging acceptance of the epistemological usefulness of what he calls ‘mentalistic’ terminology. The obvious analogy between wave/particle duality in physics and the mind/matter dualism is intriguing. One could say that the materialistic and the mentalistic (physical and psychical) descriptions of human behaviour complement each other and are both necessary — just as the wave and particle aspects of subatomic systems complement each other.

The dualist position is arrived at from the assertion that the relation between the physical world and the psychic world is not that of phenomenon and epiphenomenon, but rather a relation between two primary aspects of reality:

The materialistic theory postulates only one kind of substance, namely matter, and one kind of interaction, namely physical. On the other hand, the theory that I have been advocating recognises two main types of interaction, physical and psychical, and on the psychical side a multitude of individual minds. Most systematic theorists have a natural, semi-aesthetic prejudice against any kind of dualism or pluralism, and in favour of monism — in favour, that is to say, of uniformity rather than variety, of simplicity rather than complexity, in short, of what can be measured, computed, and mathematically predicted. This Occamite attitude is admirable as a methodological policy, but fatal as a dogmatic creed.

— Sir Cyril Burt ³⁹

The origin and support for the dualist assertion is the ‘phenomenon’ of conscious awareness — the ambience and *sine qua non* of all subjective experience — which finds no place in the materialist conceptual scheme. Of course, a ‘weak’ version of dualism is quite consistent with the view that brains function entirely according to mechanistic, deterministic laws. There exists a range of philosophical positions that claim to be dualistic, but that on analysis turn out to be expositions of psychophysical parallelism, in a universe conceived to be deterministic.⁴⁰

A ‘stronger’ version of dualism differs radically from the materialist view by denying that strict determinism underlies all brain action, and conceiving the relation between the two primary aspects of reality as one of interaction. Interaction implies a two-way causal link, so that mental processes are asserted to have a causative role, influencing the physical world by initiating neurophysiological processes. Free will is then seen to be not merely the ‘subjective impression’ that thought and action are non-deterministic. On the other hand, a conceptual barrier is encountered when we then try to imagine precisely what ‘free will’ does denote. This difficulty can be exploited as a ‘counter-argument’ against dualism. This strong version of dualism is still consistent with the assertion that every mental state is associated with a concomitant neurophysiological state — but it differs radically from the materialistic view in that it entails making a distinction between mindless matter, the behaviour of which is fully accounted for

by known (essentially mechanistic) physical laws, and matter that, by virtue of its organisation, can be acted upon by influences not presently recognised by the physical sciences.

An even more uncompromising version of dualism accepts the possibility that some aspects of the psychic world might be independent of the brain. If the physical world and the psychic world really are two primary aspects of reality it is neither logically necessary, nor proven by anything presently known, that every aspect of mind should have correlates in the physical substratum of neural events. For example, an unanswered and baffling question in neurophysiology is ‘how and where are memories stored in the brain?’ The extreme dualist position we are now considering allows for the possibility that memories might not be stored in the brain at all! All that is known for certain is that the hippocampus is the principal organ for the *laying down* and *retrieving* of long-term memories. We might add that, if the evidence for telepathy is accepted, individual psychic structures seem to be linked at some deep level — they are not discrete entities in the way that brains are. Cyril Burt puts forward with unequivocal boldness the possibility that the mind, or psyche, has autonomous reality and is not simply a manifestation of physical events taking place in the brain:

But why should we assume that consciousness needs a material brain to support it? ...a closer scrutiny of the actual facts makes it more than probable that the brain is an organ for selecting and transmitting consciousness rather than for generating it. Even without a brain, I should hold, a mind by its very nature could still cognize events; but it would do so by a process akin to telepathy. Evidence from psychical research appears to bear this out.

— Sir Cyril Burt ⁴¹

To those who cling to currently fashionable materialist beliefs, views like these are ‘little occult fancies’ not worthy of serious attention. The meaning of ‘occult’ is, of course, ‘hidden’. A dualist hypothesis accepts that certain aspects of reality are indeed hidden, in the sense that knowledge of them lies beyond the scope of conventional scientific methodologies and their self-imposed limitations — their insistence on quantifiability and objectivity. There is nothing intrinsically irrational in such an admission; it is nothing more than a modest and realistic recognition of our current level of ignorance about the nature of reality. There is nothing intrinsically irrational in supposing that a useful and illuminating model of reality might consist of two more or less distinct kinds of phenomena, governed by

fundamentally different kinds of principles but capable under the right circumstances of influencing each other. What is it about this supposition that leads the materialist to perceive it as naive?

Ever since Descartes first struggled with it, interactionists have had the apparently insuperable problem of explaining how an event with no physical properties — no mass, no charge, no location, no velocity — could make a physical difference in the brain (or anywhere else). For a nonphysical event to make a difference, it must make some physical event happen that wouldn't have happened if the nonphysical event hadn't happened. But if we found an event whose occurrence had this sort of effect, why wouldn't we decide for *that very reason* that we had discovered a new kind of *physical* event?

— Douglas Hofstadter & Daniel Dennett⁴²

Here, the source of the materialist versus dualist controversy is clearly revealed: it is the vagueness of the terms 'physical' and 'nonphysical'. The protagonists on both sides of the debate appear to have tacitly accepted the view of physics as 'something you can make a mechanical model of'. Only the naive version of dualism based on the self-contradictory notion of a 'non-material substance' is demolished by this kind of argument. At the level of subatomic physics quantum theory has revealed that the fundamental 'things' of which the physical world is constituted do not, in any straightforward way, 'have' mass, charge or velocity. And, in a quite baffling way, quantum physics conflicts with the notion of 'location' and calls into question the fundamentality even of such concepts as time and space. What the dualist hypothesis really suggests is that, *similarly*, it is possible that, at the level of living organisms and in particular at the level of brain function, equally new and equally surprising principles await discovery. The dualist regards some of the baffling aspects of subjective experience as indicative of just such a possibility. Whether the new concepts would then be called 'physical or 'nonphysical' and hence whether the expanded view of reality would be a 'monist' or 'dualist' view, is merely a matter of terminology and is entirely irrelevant.

Two fundamental concepts existing from the earliest days of physical science are 'matter' and 'energy'. Matter was regarded as *real* and energy as an *abstraction* that provides, through its conservation — its persistence through all the transformations of matter — a kind of accounting system underlying the physical laws governing the transformations of matter. There is a kind of 'dualism' here that might

have persuaded 'materialists' to declare the interconvertibility of matter and energy a logical impossibility! It is interesting to note, in connection with this crude analogy between two kinds of 'dualism', that in Einstein's gravitational theory energy is not localisable.

Since dualist hypotheses cannot be faulted on logical grounds, they stand or fall according to whether empirical evidence seems to support or refute them. We shall turn to this question of evidence in later chapters. Of course, any dualistic philosophy is a unified whole in the final analysis, in that the two sides of the duality belong to a single reality; they are the Yin and the Yang.

The Psychic World

An adequate science of the psychical aspects of reality has to adopt methodologies fundamentally different from those of the physical sciences. The significant contributions to psychology, initiated by Freud and in a more profound direction by Jung and his followers, have depended on a frank recognition that subjective aspects of reality are worthy of study. The physical sciences, on the other hand, owe much of their success to the insistence that observational data must be objective. It seems to have been this insistence on objective aspects of reality, and its attendant marvellous success, that have been largely responsible for the materialist reductionist picture of reality that has emerged as the dominant world view, and for the demise of dualistic philosophical systems.

If there really are aspects of reality that lie outside the scope of the physical sciences, could it be that the principles by which they operate are destined forever to lie beyond the reach of human understanding? This might well be the case. Consider: a dog is an intelligent being that shares the world with us. It can have only the haziest notion of the concerns that govern the lives of the human beings it knows. It knows nothing of art or science; it has no inkling of the existence of such things. Its mind has evolved to deal with canine thoughts and canine deeds. Similarly, our minds have been evolved to deal with human thoughts and human deeds. We are limited by our 'human-ness'. Isn't it then possible that there are aspects of the world of which we do not and cannot have any inkling? Is it possible that there are answers that we cannot arrive at because we cannot even formulate the questions? Yes, it is possible. Perhaps, as Haldane said, the world is queerer than we can suppose.

On the other hand, the present range and depth of human knowledge of *physical* processes is far greater than might have been expected, considering our human limitations — our dependence on perceptual mechanisms not very different from those of other

mammals, together with the notorious proneness of the human mind to errors of judgement, false beliefs and irrationalities. Jung's pioneering investigations of *psychical* processes have already provided a wealth of valuable insights, particularly into unconscious processes, in spite of the difficulty that the unconscious mind cannot be directly observed. Wilhelm Wundt, the founder of experimental psychology, side-stepped this difficulty by denying the existence of an unconscious mind (an attitude strangely reminiscent of the more extreme behaviourist attitude that was to come later, denying the existence of 'mind' altogether):

[as regards the] so-called unconscious processes, it is not a question of unconscious psychic elements, but only of *more dimly conscious* ones... for hypothetical unconscious processes we could substitute actually demonstrable or at any rate less hypothetical conscious processes.

— Wilhelm Wundt ⁴³

The unconscious mind, *like everything else*, can be known only through its effects on the contents of consciousness. In Freud's psychological theories unconscious contents are seen as thoughts, feelings and instincts that the mind represses because of their unacceptability to consciousness. They form subconscious 'complexes' that influence the functioning of the conscious mind. Their influence can be disruptive, producing neuroses and psychotic states. Freud overemphasised repression of the sexual instinct and had a reductionist tendency to see this as a universal principle capable of 'explaining' all aspects of the human mind. This 'central dogma' of Freudian psychology can best be understood as a consequence of Freud's place and time — it reveals an aspect of Freud's own psychological make-up and of that of the neurotic patients he encountered as a practising psychiatrist. Jung's insights into human psychology are more penetrating and in a sense more 'scientific'. The psyche contains the conscious mind and the *personal* unconscious, which are moulded by life experience and together are responsible for personality characteristics of each unique individual. Jung identified a deeper stratum, which he called the 'collective unconscious', underlying the personal psyche. He refers to the collective unconscious as a more 'primitive' region of the psyche. It is the common inheritance of all human beings — it shapes and organises the psyche in ways that transcend cultural and individual differences. The causal agencies of the collective unconscious are the *archetypes*⁴⁴, they reveal themselves through their manifestations in consciousness. The recurrent themes of myths, and the fairy-tales of world literature, are archetypal

manifestations, as are vivid symbolic dreams, fantasies and delusions that impress by their atmosphere of *meaningfulness* — even when the meaning conveyed eludes intellectual analysis. Jung's insights into the nature of the human psyche grew out of his lifelong study of the symbolism of dreams⁴⁵, of myths and of esoteric systems of thought. He made a particularly intensive study of the bizarre and obscure symbolism of the alchemists⁴⁶, revealing it to be a projection of inner psychic transformations rather than simply the naive, embryonic form of the science of chemistry.

Jung's psychological theories have been criticised on the supposed grounds that his intuitive hypotheses are anti-rational and unscientific. A fascinating recent study by Richard Noll⁴⁷ reveals the influence on Jung's thought of various pseudo-religious movements that were current in the German-speaking world in the latter half of the nineteenth century and in the early twentieth century, and draws attention to the mystical side of Jung's character and the obvious charismatic nature of his personality. Noll presents the facts he has unearthed as if they somehow diminish, or even invalidate, Jung's theoretical insights. But are not these very facts themselves a manifestation of the operation of very deep levels of the human psyche? Are they not *in themselves* a vindication of Jung's hypotheses? The nature of the human psyche, particularly at unconscious levels, is not amenable to scientific inquiry as normally conceived. If knowledge and understanding are to be gained of matters that, for various reasons, lie beyond the scope of conventional scientific methodologies, then the methodologies for acquiring knowledge need a broader base. Any lesser response is simply an admission that we are satisfied with an impoverished view of reality.

Jung's contribution has been attacked from another direction. Theologians tend to see Jung as a reductionist intent on reducing the spiritual aspects of Man to the level of primitive instinct and dismissing the idea of God as 'nothing but' an archetype:

Jung breached certain strictly materialistic frameworks of modern science; but this fact is of no use to anyone, to say the least — one would have liked to rejoice over it — because the influences that infiltrate through this breach come from the inferior psychism and not from the Spirit, which alone is true and alone able to save us.

— Titus Burkhardt⁴⁸

Whatever services the work of C.G. Jung may have rendered to make alchemy better known, they are inadequate in that they limit alchemy to a psychology that is devoid of a transcendental and spiritual origin for the symbols that appear to the human psyche.

— Sayyed Hossein Nasr⁴⁹

These authors have misunderstood. Jung's attitude to psychic realities was one of awe and profound respect — the idea of denigrating anything as 'only psychological' is the antithesis of Jung's attitude. Jung was scornful of the reductionist 'nothing but' ('nicht als'). The archetypes are asserted by Jung to be akin to "primitive instincts" — primitive in the sense of being, in evolutionary terms, older than the 'rational' mind of 'modern man'. Older, and often wiser. Jung's stance as a psychiatrist was *pragmatic*, his aim being to help people resolve psychological difficulties by assimilating the wisdom of unconscious mental activity. His stance as a psychologist was *empirical*. As a psychologist his concern was with observable *facts*, not with theological or metaphysical speculation about transcendental realities⁵⁰. When Burkhardt quotes from Jung's writings, his biased selection of passages grossly misrepresents Jung's rich and profound insights. When Jung abandons his objective stance and expresses his personal convictions, he and Burkhardt appear to have much in common⁵¹ :

Theology does not help those who are looking for the key, because theology demands faith, and faith cannot be made: it is in the truest sense a gift of grace. We moderns are faced with the necessity of *rediscovering the life of the spirit*; we must experience it anew for ourselves. It is the only way in which we can break the spell that binds us to the cycle of biological events.

— C.G. Jung⁵²

The psyche is the apprehender and organiser of *all* knowledge, whether it be apprehended through sensory perception, or through the symbolic and intuitive emanations from inner psychic depths. *All* experience, religious experience not excepted, is 'psychological' — *how could it be otherwise?*

In their present forms, worked over and exceedingly aged,... religious traditions often resist further creative alterations by the unconscious. Theologians sometimes even defend these

‘true’ religious symbols and symbolic doctrines against the discovery of a religious function in the unconscious psyche, forgetting that the values they fight for owe their existence to that very same function. Without a human psyche to receive divine inspirations and utter them in words or shape them in art, no religious symbol has ever come into the reality of human life.

— *M.-L. von Franz* ⁵³

Jung’s essay *On Psychic Energy* ⁵⁴ identifies striking analogies between dynamical principles operating in the physical world, and psychic processes. Of course, analogies of this kind cannot be pushed too far. Deducible properties of ‘mind’ are, by their nature, qualitative rather than quantitative. Modes of investigation and description appropriate to mental phenomena cannot be expected to mimic those appropriate to the physical sciences. Mental processes operate on the basis of *association* of perceived events with what they signify; events are imbued with *meaning* assigned to them by past experience. This double structure of ‘causes’ in the mental realm, whereby a cause consists of a sensation together with what it signifies, led Bertrand Russell to the concept of ‘mnemonic causation’, ⁵⁵ From these and other observations, a picture emerges of the human psyche as a structured entity, whose principles of operation are amenable to exploration.

All our data, both in physics and psychology, are subject to psychological causal laws; but physical causal laws, at least in traditional physics, can only be stated in terms of matter, which is both inferred and constructed, never a datum. In this respect, psychology is nearer to what actually exists.

— *Bertrand Russell* ⁵⁶

A Parable

Someone saw Nasrudin searching for something on the ground.

‘What have you lost, Mulla?’ he asked. ‘My key,’ said the Mulla. So they both went down on their knees and looked for it.

After a time the other man asked: ‘Where exactly did you drop it?’

‘In my own house.’

‘Then why are you looking here?’

‘There is more light here than inside my own house.’ ⁵⁷

Science has sought to understand the ‘why’ of existence by searching ‘outside’, in the light of ‘objectivity’. Perhaps it is time to go into the house where the searching will be more difficult — to look for the key.

Notes and References

1. Jung, C.G., *Der Geist der Psychologie*, *Eranos Jahrbuch* 1946: revised and translated in Jung 1982b, p.79.
2. Langer, Susanne K., *Philosophical Sketches*, 1962: quoted in *Strange Glory* (Goldberg, G., ed.) St. Martins Press, New York 1977, p.88.
3. Eliade 1960: quoted in *Strange Glory*, p.29.
4. Rosenblueth 1970, p.66.
5. Wheeler, J.A., Law without law: in Wheeler & Zulek (eds) 1983, p.182.
6. Hippocrates, *The Sacred Disease*: quoted by Gregory 1984, p.31.
7. Nietzsche, F., *Menschliches – Allzumenschliches (Human, All Too Human)* 1878; Hollingdale, R.J. (transl. & ed.), *A Nietzsche Reader*, Penguin 1977, p.71.
8. Smullyan, Raymond R., *The Tao is Silent*, Harper & Row, New York 1977: reprinted in Hofstadter & Dennett (eds) 1982.
9. Quoted by Mukunda 1993, p.10.
10. Russell 1921, 1992, p.10.
11. Wundt 1903.
12. Ortega y Gasset 1987, p.57.
13. Jung 1982b, p.125.
14. i.e. *The Rubaiyat of Edward Fitzgerald*.
15. Cohen 1979.
16. Watson 1928: quoted by Koestler 1978.
17. Gregory 1984, p.281.
18. Skinner 1953, p.30: quoted by Koestler 1978, p.166.
19. Gregory 1984, p.24.
20. Descartes 1637.
21. Quoted by Hadamard 1945, and Penrose 1990, p.584.
22. Penrose 1990, p.57.
23. Read, Sir Herbert, *The Art of Sculpture*, Pantheon Books, New York 1961, p.xi.
24. Hughes, Ted, *Poetry in the making*, Faber, London 1967, p.17.
25. Popper & Eccles 1977.
26. Rawcliffe 1952, 1959, p.22.
27. Nagel, E., What is it like to be a bat?: in Hofstadter & Dennett (eds) 1982.
28. Wittgenstein, Ludwig, *Tractatus Logico-Philosophicus*, Routledge, London 1922.
29. Hofstadter & Dennett (eds) 1982, p.473.
30. Burt, C., The Concept of Mind: in Shanmugan 1972, p.23.
31. Koestler 1979, p.240.
32. Eddington 1934.
33. Unamuno 1921, 1962, p.117.
34. See Kenny’s lecture, Determinism and mind: in Longuet-Higgins *et al.* 1972 (this publication is a transcript of Edinburgh University’s Gifford Lecture series 1971/2, which consisted of prepared talks and discussions among the four participants); see also Kenny’s essay in Hondrich (ed.) 1973, and Kenny 1989.
35. Planck 1931, p.91.
36. Popper, K.R., Indeterminism in quantum physics and in classical physics, *Brit. J. Phil. Soc.* 1, 1950, p.117; *ibid.*, p.173.
37. MacKay, D.M., *Freedom of Action in a Mechanistic Universe*, Cambridge Univ. Press 1967 (the 21st A.S. Eddington Memorial Lecture).

38. 'Occam's razor' is no more than the commonsense observation that straight-forward explanations usually have more chance of being true than explanations that seem contrived and far-fetched. It isn't a fundamental scientific principle. It cannot be invoked as a justification for refusing to consider logically viable alternatives to a widely-accepted hypothesis.
39. Burt, C., The concept of mind: in Shanmugan 1972, p.23.
40. See for example Rosenblueth 1970.
41. *loc. cit.* (ref.38), p.19.
42. Hofstadter & Dennett (eds) 1982, p.388.
43. Wundt 1903, vol.3, p.327: quoted by Jung 1982b, p.74.
44. Jung 1968, vol.9, part I, *The Archetypes and the Collective Unconscious*; part II, *Aion: Researches into the Phenomenology of the Self*; etc.
45. Jung 1984.
46. Jung 1968: vol.12 (1944) *Psychology and Alchemy*; vol.13 *Alchemical Studies*; vol.14 *Mysterium Coniunctionis*.
47. Noll 1994.
48. Burkhardt, T., Cosmology and modern science, *Tomorrow*, Winter 1965, p.27: reprinted in *The Sword of Gnosis* (Jacob Needleman, ed.), Routledge & Kegan Paul, London 1974, p.122.
49. Nasr, S.H., *Man and Nature: The Spiritual Crisis of Modern Man*, Allen & Unwin, London 1976, p.113.
50. A definitive statement of Jung's attitude on this point can be found in a footnote on page 195 of *Aion*: 'There are people who, oddly enough, think it is a weakness in me that I refrain from metaphysical judgements. A scientist's conscience does not permit him to assert things he cannot prove or at least show to be probable. No assertion has ever yet brought anything corresponding to it into existence. "What he says, is" is a prerogative exclusive to God.'
51. In an interview for the *Daily Mail* in 1955, Jung's concluding words were: 'All I have learned has led me step by step to an unshakeable conviction of the existence of God. I only believe in what I know. And that eliminates believing. Therefore I do not take His existence on belief – I *know* that He exists.' Jung 1980, p.242.
52. Jung, C.G., *Seelenprobleme der Gegenwart*, Raschner, Zurich 1931, p.83. English transl. *Modern Man in Search of a Soul*, Kegan Paul, Trench & Trübner, London, and Harcourt Brace, New York 1933, p.140: quoted in Jung 1945.
53. von Franz, M.-L., The process of individuation: in Jung & von Franz (eds) 1964, 1978, p.253.
54. Jung, C.G., *Über die Energetik der Seele*, Zurich 1928: English transl. On psychic energy, in Jung 1982b.
55. Russell 1921, 1922.
56. *ibid.*, p.308.
57. Shah, Idries, *The Exploits of the Incomparable Mulla Nasrudin*, Jonathan Cape, London 1966.

6 ARTIFICIAL INTELLIGENCE

Thinking Machines

Cartesian dualism was attacked by de la Mettrie, in his controversial book '*L'Homme Machine*'.¹ It is interesting to note that its publication date, 1748, belongs to the period during which the art of constructing 'automata' (clockwork mechanisms that mimic the appearance and actions of human beings) reached a high level of sophistication. De la Mettrie denied Descartes' contention that mechanistic devices could not possibly, even in principle, behave like thinking beings, and insisted that human beings *are* in fact mechanistic devices.

The view that all mental phenomena, including consciousness, are entirely a consequence of mechanistic processes taking place in the brain is the philosophical position of 'materialistic monism'. It is the creed that, since de la Mettrie's day, has grown more and more plausible through the support given to it by the rise of the materialistic reductionist trend of scientific development. Rapid developments now taking place in computer technology and neurophysiology have given substantial support to de la Mettrie's proposal. Many aspects of mental activity can now be simulated by computer programs. Chess-playing programs already exist that are able to compete with the most highly gifted human players. Computers can already replace human beings in tasks calling for skill and judgement, such as overseeing and controlling complex industrial processes or piloting aircraft and space probes. Computers can be equipped with peripheral data-collecting devices such as cameras and microphones and programmed to interpret incoming information and act on it. Humans and animals are still far superior to machines in these *perceptual* skills — the problems encountered in producing programs at this level of intricacy are formidable — but progress in these areas is rapid. The development of computer technology with a view to endowing machines with more subtle perceptual and intellectual skills constitutes the field of Artificial Intelligence (AI).²

Whether any particular machine is behaving 'intelligently' is of course a matter of definition. Even a chess program can be said to be making intelligent decisions. The answer depends on the criteria we adopt for assessing intelligence. A particularly well-known criterion is the 'Turing test': if a machine were able to carry on a conversation with a human being, and do it so convincingly that the human being could not make out whether he is conversing with a machine or another

person, then the machine would be deemed to be intelligent. Notice that Turing's criterion is essentially the same as Descartes' criterion for deciding whether machines can have 'minds'. It equates intelligence with human linguistic competence. It suggests a formidably difficult goal for the science of AI to aim for, and there is no reason why attempts to develop intelligent machines should aim in that direction at all; why should we want machines to be endowed with the same *kind of intelligence* that characterises humans? Turing's test is a particularly severe test — a machine that could pass it would have to incorporate technical subtleties *very* far in advance of present developments. Machines with the range and flexibility of intelligence displayed by even a mouse, when it encounters the world and learns how to survive, would be very far in advance of present developments. Nevertheless, it is no longer possible to concur with Descartes in his belief that linguistic performance by machines, comparable with that of human beings, is impossible *in principle*.

The study of brain structure and function reveals that, as far as we can make out, brains are like computers in that they are information-processing devices, and neural networks operate on physical principles similar to those of digital computers. This indicates that the differences may only be a matter of complexity of organisation.

Strong AI

The *strong AI* hypothesis is arrived at by extrapolation from developments in computers and programs, and current knowledge about the way brains function. It asserts that the brains of humans and animals *are* computers, and hence that *consciousness*, not just intelligence, is in principle possible in computers — that the right kind of complexity in the hardware and the right kind of subtle and intricate programming could give rise to machines that are *aware* of their existence and of what they are doing, in much the same way that we are.

The supporters of the strong AI hypothesis present their case with enthusiasm and conviction. The most forthright and imaginative supporter is Douglas Hofstadter. He shows us precisely what belief in the hypothesis entails — its consequences and ramifications — in his delightfully witty and entertaining book *Gödel, Escher, Bach*. The collection of essays, *The Mind's I*, edited by Hofstadter and Daniel Dennett, contains thought-provoking arguments for and against the strong AI belief, many of them employing science-fiction stories to illustrate the issues.³

Computers are devices that *implement algorithms*. That is to say, they manipulate given information (the input) to arrive at a

transformation of it (the output). Implementing an algorithm is a strictly deterministic process in the sense that the output data is an *inevitable* and *unique* consequence of the input and of the internal state of the machinery at the start of the implementation. Thus, the strong AI belief necessarily implies strict deterministic causality of thought and action, of the kind discussed in previous chapters. That is, all the attributes and capabilities of mind come about from algorithmic manipulations applied to the raw data of sensory perception and memory of past experience. Many of the algorithms involved must, obviously, be of unimaginable, near miraculous, intricacy and subtlety.

Algorithms and their implementation are essentially abstract — the nature of the material devices that carry out the information processing ought to be irrelevant. Whatever device is used for carrying out these processes, whether it be a human brain, an electronic computer, or even some fantastic contraption of levers and gearwheels, should make no difference. If the underlying algorithms are those whose implementation in living brains gives rise to consciousness, then consciousness will be present.

This is an astonishingly bold claim.

From what is now known of the capabilities of algorithmic devices (computers) and from what is known of the structure and function of living brains, it is undeniably true that many brain functions are indeed algorithmic. The mechanisms of sensory perception seem to be largely, and perhaps entirely, algorithmic. The activity of the visual cortex, for instance, appears to have much in common with the kind of programs that have been developed for pattern-recognition and image-processing, that make use of feature extraction followed by interpretation based on matching with memory contents. In the living brain these elaborate processes are carried out automatically, at an unconscious level. Reflex actions are produced by automatic, computer-like operations of the neural network. This is in all probability also true of learned responses (conditioned reflexes) and even highly complex systems of learned responses characteristic of thoroughly-practiced skills like driving a car or playing a musical instrument. Characteristics of predetermined algorithm-like behaviour can be seen in all kinds of habits; habits in ways of thinking as well as habits associated with often-repeated muscular actions. The learning of a skill or a habit can be regarded as the establishment of a subroutine in the programming of the brain.

In view of all this, it becomes clear that many of the skills involved in perceiving, thinking and acting are based on algorithmic principles not essentially different from those on which digital computers operate. Although it is not clear at present how the more

‘creative’ and imaginative aspects of thinking could be done by algorithms, it becomes possible, with a fair degree of plausibility, to suppose that *all* the subtle capabilities of living brains could be simulated by a machine for implementing algorithms. The strong AI claim amounts to the assertion that such machines would be conscious entities. It implies the possibility of information-processing devices that not only think, but also feel; automata that experience joy and sorrow, that know what it is to love and to hate, to feel remorse or be moved to pity. Can this be right?

The strong AI claim is that these wonderful automata already exist — we are they.

Consciousness is put in a peculiar situation. It is assigned the role of a passive bystander, experiencing the effects of a strictly deterministic stream of events. If our minds work entirely on algorithmic principles, then all our thoughts and feelings, all our actions, are strictly determined by the influx of perceptual data and by past experience. Consciousness then initiates nothing. Whence, then, comes the strong subjective impression to the contrary, that we call ‘free will’, ‘volition’ or ‘intentionality’?

The question is sometimes raised of the need for consciousness in the evolutionary scheme. How did consciousness ever evolve if it has no function as an initiator of events — if it confers no advantages, in the ‘struggle for survival’, on the organisms that possess it? If the behaviour of a conscious organism really is determined by automatic information-processing, then, clearly, an unconscious organism endowed with the same information-processing capabilities would survive and evolve just as effectively. Indeed, the two organisms would be indistinguishable to an ‘outside observer’. Does it not seem rather cruel of Nature to present consciousness with unpleasant sensations — hunger, pain, anxiety, fear — if consciousness has no active initiatory role in bringing about the appropriate behavioural responses?

Various authors have attempted to answer these questions by claiming that consciousness provides organisms with survival advantages by enabling them to *imagine* and thereby to anticipate events. These authors appeal to the ‘consciousness of mental imagery’:

I shall tentatively define consciousness as the awareness of the self... coupled with awareness of the objects around one and of one’s relations to them. According to this definition of ‘awareness’ this implies that consciousness presupposes internal representations not only of objects around one but also of the self and its relation to those objects...

The interpretation of consciousness I have given above answers one question that has been raised since the demise of interactionism — viz. **why consciousness should exist at all**. If it is not a factor that influences biological events, what is its biological value? Is it biologically redundant? The answer is now clear: the physiological aspect of consciousness resides in the complex internal representations I have specified. To the extent that these internal representations assist in the production of appropriate behaviours, their biological value is self-evident. In addition there is the sociological value of the subjective self-categorisations which they permit and of the introspective utterances in which they are expressed.

— *G. Sommerhoff*⁴

It seems to me that the biological advantage of consciousness suggested here is reasonable and quite convincing. But it is not consistent to accept it and at the same time to abandon ‘interactionism’. The attempted explanation has to appeal to some kind of interactionism — i.e. **to a dualistic hypothesis that allows consciousness to have some influence on brain processes**. Otherwise, whatever (deterministic, algorithmic) processes take place in the brain when one is ‘conscious of internal representations’ would be just as effective *without* consciousness. **Unless one abandons the materialistic view of the brain as nothing more than a computer, this kind of ‘role’ for consciousness begs the question.**

Supporters of strong AI regard questions about the ‘role’ of consciousness as arising from the fallacy of conceptualising consciousness as something separable from the decision-making algorithmic system of which it is an attribute. They claim consciousness to be simply an unavoidable concomitant, an intrinsic property of the kind of algorithmic systems that are necessary for producing behaviour patterns as subtle and complex as those of highly-evolved animals including man:

We are conscious automata, and our consciousness is just an accidental froth, an aura, an epiphenomenon: our sensations and feelings are but the collateral product of the mechanism of the nervous system, like the tunes ground out on the wheels of a barrel-organ, having no effect on the machinery.

— *Julian Huxley*⁵

As we have seen, dualism arose from the fact that consciousness *seems* to be a very different kind of thing from any

concept encountered in the realm of matter. It can be argued that this is simply a consequence of another of those hierarchical gaps between levels of complexity in the physical world — the gap between present knowledge of matter at its most complex, and the ultimate complexity, subtlety and intricacy of organisation that matter is capable of. According to strong AI, when this gap is bridged, consciousness will be understood as a *property of matter*, and the ‘problem of consciousness’ will have been solved.

This, in outline, is the reductionist paradigm in its modern form.

The Opposition to Strong AI

John Searle’s ‘Chinese room’ thought experiment⁶ is an interesting attempt to refute the belief in strong AI by a *reductio ad absurdum*. Searle’s conviction is that no device that operates *only* on the basis of algorithmic computation, even if it is so intricately designed that it can seem to possess the faculty of understanding, can ever be said to really *understand* anything in the way that conscious minds do. He asks us to imagine an algorithmic process that is able to pass the Turing test when engaged in conversation with a speaker of Chinese. According to the strong AI hypothesis, any device that can implement the necessary algorithms would be deemed to ‘understand Chinese’ while carrying out this algorithmic processes. Searle’s device, his ‘computer’, consists of a room containing an astronomical number of bits of paper with markings on them, an enormous set of instructions for using them in calculations by removing and making marks on them and shifting them around in various patterns, and a person *who knows no Chinese* assigned the task of blindly following the instructions for manipulating the papers with their, to him, meaningless marks. Outside the room is the human Chinese speaker, who writes his remarks in Chinese on bits of paper, hands them into the room, waits for the manipulations to be done, and then receives the ‘computer’s’ responses written in Chinese on bits of paper handed out to him. Admittedly, no human being could carry out the necessary manipulations in a reasonable time, but this does not matter; this is a *thought* experiment — practicalities are irrelevant.

The strong AI hypothesis now asserts that the contents of the room, the processes going on in it, are *understanding Chinese*. The room is possessed of a conscious Chinese mind. *It passes the Turing test*, and so the believers in strong AI would have to accept such a *conclusion*. Searle points out that this is manifestly absurd — how on earth can billions of bits of paper, shifted about by a person to whom the marks on them mean nothing, be said to be *understanding*

anything? The net result is only an *illusion* that understanding is taking place.

What Searle is drawing attention to is the crucial difference between blindly implementing algorithms and understanding the *meaning* encoded in them. It might be possible for a computer to be programmed to mimic human thinking to the extent of fooling us by carrying on intelligent conversations with us, but that gives us no right to conclude that it understands what it is doing — i.e., no reason to infer that it is a *conscious* entity. In Searle's words, that would be to confuse *simulation* with *duplication*.

Searle concludes from his arguments that there must be something more to living brains than algorithmic computation, that sets them apart from artificial devices that work only by executing programs. (He then, unfortunately and rather astonishingly, misses the full implications of his argument — that living brains are something more than computers. Near the end of his essay is a remarkable statement: 'Of course the brain is a digital computer. Since everything is a digital computer, brains are too.' It is difficult to see why he made this bizarre remark, which seems to flatly contradict his otherwise carefully-presented argument.)

The response of strong AI believers to Searle's Chinese room, of course, is simply to deny the absurdity: if the manipulations carried out in the room are supposed to be complex enough to be an *analogue* of the algorithmic processes carried out by the brain of a human Chinese speaker, then they would *ipso facto* have consciousness and understanding! This kind of debate is irresolvable by rational argument; it is a clash of *beliefs*, supported only by intuitive convictions rather than facts. Argumentation from various philosophical positions tends to be interminable if unsupported by adequate empirical data. The real question is whether there is any actual observational data that would confirm or deny the *belief in materialistic reductionism* that underlies the strong AI hypothesis.

Roger Penrose's remarkable book *The Emperor's New Mind*⁷ is a wide-ranging exploration of the present state of all those branches of scientific knowledge that have relevance to the problem of the relationship between mind and matter. These topics are all woven around and lend support to Penrose's central theme, which is a denial of the notion that living brains are 'nothing but' algorithmic devices. Compelling arguments are presented in support of the view that creative thinking displays non-algorithmic characteristics. Penrose is not a dualist, his philosophical presupposition is a materialistic monist one, that 'everything is physics'. His main point is that present knowledge of physics is far from complete. The basis of physical

reality is unknown to us; our present knowledge of physical reality has inconsistencies and paradoxical features that are not adequately understood. He offers fascinating speculations about possible future developments in physical science and argues, quite convincingly, that they may well lead to important new insights into the way brains operate, and into the nature of consciousness.

Functionalism

In recent years, a school of thought known as *functionalism*⁸ has emerged, that attempts a synthesis of the developments and findings in those branches of science known as the *cognitive sciences*: computer theory, AI, cybernetics, linguistics and psychology. *Functionalism* recognises that the *functioning* of highly complex systems is to be understood, not in terms of their component parts nor in terms of the elementary processes from which their overall behaviour is built up, but *holistically*. Complex systems are to be understood in terms of the way intricate patterns of behaviour emerge as a consequence of the interrelatedness of all the parts. Higher-level processes arise from the collaborative interaction of simpler processes and can reveal qualitatively different kinds of properties from those of the lower-level processes from which they arise.

The functionalist approach to the problem of brains and minds is analogous to the *structuralist*⁹ theories in biology that attempt to supplement the extreme reductionism of molecular genetics and neo-Darwinism with a more holistic approach. Both functionalism and structuralism are motivated by the recognition that *elucidating the nature of elementary processes is entirely inadequate when the aim is to understand the macroscopic behaviour of highly complex systems*. The emphasis is on *organisation* and *structure* of the processes underlying the way a system functions. Searle's Chinese room and the brain of a Chinese person, for example, could well be *equivalent* systems, from the functionalist viewpoint.

Functionalist thinking emphasises the importance of hierarchical levels of complexity in organisation and structure, where different kinds of processes emerge at different levels of complexity. At the highest, most abstract levels *concepts such as 'consciousness' and 'understanding' emerge*. '*Emergent properties*' is the battle-cry of functionalism. *Consciousness is regarded as an emergent property*. The mistake, according to the functionalists, is to try to identify and define it in terms of the lower levels of algorithmic computation.

The functionalist way of thinking about the role of consciousness and 'free will' is well illustrated in the scenario proposed by Roger Sperry.¹⁰ According to Sperry, *consciousness and volition*

are emergent properties resulting from the way the brain functions as a hierarchical system. In Sperry's model mental phenomena, built from elementary neural events, are conceived to act as complex dynamical entities. Sperry claims that a chain of command is established, with the higher-level entities (thoughts, feelings, concepts, beliefs and intentions) involved in conscious mental processes having control over lower levels: 'Mind moves matter in the brain.'

In my own hypothetical brain model, conscious awareness thus gets represented as a very real causal agent and rates an important place in the causal chain of control in the brain events, in which it appears as an active, operational force. Any model or description that leaves out conscious forces, according to this view, is bound to be sadly incomplete and unsatisfactory. The conscious mind in this scheme, far from being put aside as a by-product epiphenomenon, or inner aspect, is located front and central, directly in the midst of the causal interplay of cerebral mechanisms. Mind and consciousness are put in the driver's seat, as it were; they give the orders, and they push and haul around the physiology and the physical and chemical processes as much as or more than the latter processes direct them.

— Roger Sperry ¹¹

It seems to me that Sperry is attempting to break out of the trap of materialistic reductionism without abandoning materialist reductionist thinking. If the lower-level processes in Sperry's model are deemed to be algorithmic computations, they are deterministic. That the higher levels don't appear to be deterministic is then simply a result of our inability to grasp conceptually the whole of what is going on. The model exploits the vagueness inherent in the concept of 'emergent properties', and the hierarchical gulf between the lowest and the highest levels, to gloss over this fact and to slip in the concepts of 'consciousness' and 'free will' by sleight of hand. In Sperry's own words, they are emergent properties arising from 'unknown brain codes' — whatever that means. Strictly deterministic causality simply does not allow patterns of neural firings to be 'pushed and hauled around'.

Sperry's model does seem to capture something of the essence of the idea of free will or conscious control. But the model is viable only if one accepts the hypothesis that living brains function on other principles than algorithmic computation. You cannot simply pretend that the higher levels are *not* computational just because different

concepts from those normally appropriate for talking about computation have to be introduced to describe and understand properties of computation at its highest level of complexity. Indeed, Sperry's model is viable only if the pattern of neural firings is *not* a strictly deterministic process. The higher-level entities could push and haul around lower-level processes only by virtue of an emergent *capacity for exploiting some aspects of reality presently unknown to physical science that would transcend strictly deterministic principles*.

A striking fact about the present level of AI is that 'cognitive skills' that can be performed superbly well by computers are those that for a human thinker (at least, for most of us!) involve intellectual *effort* — skills such as performing mathematical calculations, playing chess, making logical decisions in complicated situations. Cognitive skills that human beings perform effortlessly, such as recognising faces, interpreting the meaning of subtle facial expressions, engaging in everyday conversation, crossing a busy road, are far beyond present AI capabilities. Attempts to mimic skills of this kind by machine are primitive and clumsy; they come nowhere near human performance. Why is that? Does it not suggest that the way cognitive tasks are dealt with by the human brain and the way they are at present dealt with by computer technology are fundamentally different?

One might, roughly speaking, identify the two categories of cognitive skills (those in which machines perform better than people and those in which people perform better than machines) as *analytic* and *synthetic* skills.

Computer recognition of human faces has advanced to the stage where a photograph of a face can be scanned, features compared with previously presented photographic data, and an output response, 'male' or 'female', obtained. The output becomes more reliable as more photographs are presented. The program keeps a tally of past successes and failures and 'learns from experience'. Is the information-processing taking place here in any way analogous to what takes place in our brains when we spot someone we know in a crowd? Or when we notice that someone is annoyed, worried or pleased? It seems most unlikely. But what, then, is a human brain doing when it performs these tasks in such an apparently miraculous way?

In his essay 'Waking up from the Boolean dream'¹² Hofstadter challenges the trend of current thinking in AI circles that maintains that present methods of simulating cognitive skills by computer programming are analogous to the way cognition takes place in the human brain. The fallacy (the 'Boolean dream') is the 'information processing' model of cognition — 'cognition as computation'. Information processing is computation in the sense that it is the

manipulation of symbols. The paper-sorting and paper-marking done by the non-Chinese-speaker in Searle's Chinese room, for example, is symbol manipulation, as is the work done by a conventional computer when executing a program. This kind of symbol manipulation also takes place at the *lowest levels* of the hierarchical structure of brain function. The symbols involved do not carry any *meaning* for the non-Chinese-speaker who manipulates them, they do not carry meaning 'for the computer' that executes a program — this was Searle's point. **Nor do these lower level computations in a brain have any meaning for the possessor of the brain.** Thus the 'symbols' that are manipulated in computation are totally different from the 'symbols' involved in conscious cognition (i.e. thinking). **They ought to be called 'formal tokens' to avoid this confusion.** The symbols involved in conscious thought, on the other hand, belong to the highest hierarchical levels of brain function, where the usual concepts associated with 'computation' have given way to more holistic emergent concepts, and the 'computational' basis of it all is not much use for understanding what is going on. At this level, symbols are ideas that *signify* other ideas. They bear a similar relation to the underlying 'computational' nexus that clouds bear to the mechanics of colliding air and water molecules. They are rather like complex organisms constituted of all their meaningfully-associated ideas. They combine with each other and transform each other. They constitute our mental life. They are autonomous entities — they are not 'manipulated'. **It is at this level of complexity of a cognitive system that we have to expect *understanding* to arise.** Computers will not be capable of true understanding of what they are doing until they have reached this degree of organizational and functional complexity. Present developments in AI attempt to mimic understanding by means of lower-level types of computation, which is why so-called 'cognition' by information-processing techniques is so very different from human cognition.

Ideas are not just counters used by the calculating mind;
they are also golden vessels full of living feeling.

— C. G. Jung¹³

I hope I have not distorted Hofstadter's viewpoint in attempting to summarise it; that was not my intention. I concur with it to a large extent. But **I do not go along with Hofstadter in his belief that this kind of thinking refutes Searle;** it shows only that what needs to happen in the 'Chinese room' if it is to *simulate* understanding and pass the Turing test is far more complicated than was apparent when we first encountered Searle's argument. It is possible, still, to doubt that

conscious understanding is no more than a high-level emergent property of computation.

On ‘Feelings’

In almost all the discussions and arguments for and against the strong AI belief that algorithmic computation can be conscious if only it is sufficiently complicated, a crucial aspect of what it is like to be conscious gets left out. Two main attributes of a conscious mind or psyche are the *cognitive faculties* and what psychologists call the *affects*. Emotional responses to the experience of living characterise human subjective awareness just as much as, if not more than, the rational and cognitive aspects of mind.

As we have seen, arguments against the strong AI belief have a tough time, because various components of the cognitive and intellectual faculties *can* be simulated by artificial devices; machines *can* ‘think’, perceive, remember, etc., and thinking, perceiving and remembering are components of conscious cognitive processes. If the strong AI believer wants to think that this ‘thinking’, perceiving and remembering by computation could, by developing ever more sophisticated devices and programming techniques, eventually give rise to subjective awareness in machines, there is no way of refuting him, any more than one can refute by rational argument the belief of a man who thinks an evil spirit resides in a stone. However, the *non-cognitive* aspects of the conscious mind have been rather glibly left out of the picture by the strong AI proponents. These aspects reveal the strong AI belief rather more clearly for what it is — a superstition. If the proponents of strong AI wish to convince themselves and others that computation is all that underlies the human mind, then to be consistent they have to confront all the subjective aspects of consciousness, not just those that support their case. Once you start claiming that artificial computational devices may be potentially capable of *feelings*, then it seems to me that you are on much shakier ground. The assertion that a machine could be aware of the meaning of what it perceives and thinks simply *seems* wrong, intuitively, to those who do not share the belief in strong AI. If one asserts, further, that digital computer systems may one day have the subjective experiences of feeling discouraged, happy, envious, proud, angry, frustrated, sympathetic or afraid, that they might know joy and love, that they might experience awe and wonder, then it all begins to seem not just wrong, but rather ludicrous.

I feel in much the same position as Rostand faced with neo-Darwinism, whenever I consider the strong AI arguments: ‘for whatever my denial is worth, I cannot change it to assent.’

Notes and References

1. de la Mettrie 1748.
2. Johnson 1986.
3. Hofstadter 1979; Hofstadter & Dennett 1981; Dennett 1992.
4. Sommerhoff 1974, p.69.
5. Huxley 1942: quoted by Cyril Burt, in Shanmugan (ed.) 1972, p.4.
6. Searle, J., Minds, brains and programs: in Hofstadter & Dennett 1981, p.353; reprinted from Searle 1980.
7. Penrose 1990.
8. See, for example, Pagels, H.R., Computer culture: the scientific, intellectual and social impact of computers, Ann. New York Acad. Sci., 426, 1984 (the proceedings of a symposium in which the functionalist viewpoint clearly emerged).
9. Goodwin et. al., (eds) 1989.
10. Sperry, R., Mind, brain and humanist values, in Platt, J.R. (ed) New Views on the Nature of Man, Chicago Univ. Press 1965.
11. *ibid.*
12. Hofstadter 1986, p.631.
13. Jung 1982a, p.4.

7 STATES OF CONSCIOUSNESS

Mental States

Ordinary waking consciousness is associated with a wide variety of familiar 'states of mind' which we call emotions, moods and feelings. More unusual mental states, with more or less well-defined characteristics, are also identifiable.¹ In this chapter I shall draw attention to a few of them. The notion introduced by behavioural psychology that mental states lie outside the scope of 'scientific' investigation because they are subjective is responsible to a large extent for our present paucity of knowledge about them. It is an erroneous notion. Though it is true that no-one can directly observe what another is experiencing, the structure and function of the human psyche is nevertheless a common inheritance of all of us, just as human physiology is. Although this structure and function will vary in detail from individual to individual because we each have our own unique personality, it is not at all 'unscientific' to assert the validity of the generalised concept of 'the human mind' or 'the human psyche' and to attempt to investigate it. When we talk to each other about our feelings, our 'mental states', we are appealing to this common ground, this universality of inner experience, and we understand each other. The very existence of 'mentalistic terminology' in natural human languages, and the possibility of empathy between people, gives the lie to the stance of behavioural psychology. The consensus surrounding the meaning of words denoting subjective states gives a degree of objectivity to such states.

A century ago, Frederick Myers² emphasised the importance for psychology of attempting a systematic exploration of consciousness, to establish 'maps' of subjective experience that would reveal the topography of psychic structure and the pathways linking what would otherwise remain curious isolated facts. The plausibility of Myers' proposal is substantiated by the application of catastrophe theory³ in attempting to describe cyclical changes and abrupt transitions in certain types of psychopathology, and in attempts at constructing 'geometrical' models that parametrise mental states.⁴ Apart from these meagre speculations, there has been very little progress in the direction suggested by Myers.

Dreams

The most familiar ‘altered state of consciousness’ is of course the peculiar kind of sleep in which *dreams* are experienced.⁵

The phenomenon of sleep is universal.⁶ Even fishes and insects — animals that appeared quite early in evolution — indulge in periods of inactivity and torpor that clearly correspond to what, in higher animals such as birds and mammals, we would call sleep. The universality of the phenomenon indicates that it has some crucial importance, yet **science has so far been unable to give a satisfactory answer to the question ‘what is sleep for?’** The evolutionary process has developed and refined elaborate mechanisms of sensory perception, enabling animals to respond efficiently to their environment. In the ‘struggle for survival’ the alertness of an animal to what is happening around it is, obviously, crucial. Yet all highly-evolved animals engage in an activity that flies in the face of this evolutionary imperative — **they spend a large portion of their time asleep!** During sleep alertness to the environment is absent or reduced to a minimum; **a sleeping animal is in a very vulnerable situation.** We have here a profound paradox. Rapid developments in brain research in recent decades have provided insights into the physiological concomitants of the sleeping state but have brought us no nearer to an answer to the fundamental question.

Dreams are an aspect of the sleeping state whose significance is even more elusive. They seem to have been ignored by science until the discovery that they are accompanied by ‘rapid eye movements’ (REM). This discovery at least gave a method of investigating the duration and frequency of the dream state and led to the present scientific interest in the sleeping and dreaming states.

In the mid 1960s Christopher Evans and Ted Newman offered a theoretical ‘explanation’ of dreams, based on the brain/computer analogy. Computer systems require the occasional implementation of tidying-up and sorting-out operations — **the running of old programs and data files that are no longer needed.** Essentially, the proffered explanation is that the dream state corresponds to the analogous sorting-out of the brain’s programs and data:

At night, with the sensory input reduced, some parts of the brain would now get to work on the data pool, sorting out the material into ‘wanted’ and ‘unwanted’, filing the data according to whether it would be needed for immediate access

or long-term store. The REM periods with their accompanying phases of hyperactivity might represent the sorting and transferring process.⁷

There is a great deal of plausibility in this analogy. Many dreams do indeed seem to consist of jumbled impressions made up of memories of recent waking experience of a trivial kind. The symptoms of sleep deprivation, or, more significantly, *dream* deprivation induced by interrupting REM sleep whenever it begins — irritability, reduced cognitive skills, hallucinations, etc. — give the impression of a system that has been overloaded with unsorted information. On the other hand, the imagery of dreams is sometimes strangely unrelated to the events of waking experience. The explanation also fails completely to take into account the existence of dreams with meaningful content. There are many instances of creative solutions to problems being presented in dreams. As is well-known to psychologists, the symbolic content of dreams often has nothing whatever to do with the trivia of the waking life of the dreamer but instead provides relevant and sometimes profound insights that contribute to the developing maturity of the psyche.

In discussing the analogy, Evans and Evans⁸ acknowledge its inadequacies but then immediately fall into the trap of the reductionist ‘nothing but’ way of thinking. They refer to the sorting process as ‘Dream type A’ and call those fragments of it that impinge on consciousness ‘Dream type B’:

The second, Dream type B, is nothing more than a subsection of type A, modified in some degree by the interposition of consciousness and the vagaries of memory, and is the thing we talk about over coffee and toast and on which all theories have erroneously and misleadingly been based.

We have here a beautiful illustration of the pitfalls of reductionist habits of thought. A *tentative hypothesis* has been put forward, acknowledged as such and its inadequacies pointed out, and then all alternative explanations have somehow, miraculously, become ‘erroneous and misleading’!

In 1983, Sir Francis Crick and Graeme Mitchison⁹ put forward a theory of the dream state based on speculations drawn from neurobiological research and computer science. They postulate that the neurological pathways that are created during the development of the mammalian brain and in the course of day-to-day learning are laid

down in a manner that involves some randomness. This randomness would give rise to inappropriate responses if it were not periodically eliminated. The elimination of these 'potentially parasitic modes' is, according to the hypothesis of these authors, the function of REM sleep. They refer to the process as 'reverse learning' — 'we dream in order to forget'. They conclude that

in this model, attempting to remember one's dreams should perhaps not be encouraged, because such remembering may help to retain patterns of thought which are better forgotten. These are the very patterns the organism was attempting to damp down.

Crick and Mitchison emphasise the tentative nature of their hypothesis — it isn't asserted dogmatically. But all evidence against it is totally ignored: there seem to be no instances of ill effects in individuals who habitually remember and record their dreams — on the contrary, dream analysis has proved beneficial in psychiatric work. The contribution of dreams to creative thought is also conveniently ignored. The very fact that we are consciously aware during REM sleep would appear to contradict the model.

There are numerous examples of valuable insights and subconscious creative thought processes emerging into consciousness in the form of dreams. An entertaining example is the dream of Elias Howe, the inventor of the sewing machine. The problem of how to lock the stitches had been troubling him, and seemed intractable. He then had a nightmare in which he was surrounded by fearsome savages who would kill him if he failed to solve the problem:

In the vision he saw himself surrounded by dark-skinned and painted warriors, who formed a hollow square about him and led him to a place of execution. Suddenly he noticed that near the heads of the spears which his guards carried, there were eye-shaped holes. He had solved the secret! What he needed was an eye near the point. He awoke from his dream, sprang out of bed, and at once made a whittled model of the eye-pointed needle, with which he brought his experiments to a successful close.¹⁰

The contents of dreams are often absurd, yet we do not normally notice incongruities in dreams. While dreaming we usually uncritically accept as normal happenings that, in waking experience,

are impossible. Occasionally, our normal waking faculties are aroused and we realise: "this is absurd, I must be dreaming." More rare is the complete intrusion of *full awareness* during a dream, without the dreamer awakening. The dreamer is then able to manipulate the content of the dream at will and to experience the 'virtual reality' of the dream in a state of consciousness indistinguishable from the waking state. Celia Green¹¹ has given the name '*lucid dreaming*' to this fascinating phenomenon. In studying numerous reports of lucid dreams, Celia Green concluded that the clarity and stability of the visual imagery was most pronounced and most nearly resembled the imagery of waking perception in *those dreams where the subject seems to leave his or her body and observe it from the outside*. The sensations accompanying lucid dreaming can be quite strange, as is evident in the following account of one of Frederick van Eeden's many lucid dreams:

In January 1898 I dreamt that I was lying in the garden before the windows of my study, and saw the eyes of my dog through the glass pane. I was lying on my chest and observing the dog very keenly. At the same time, however, I knew with perfect certainty that I was dreaming and lying on my back in my bed. And then I resolved to wake up slowly and carefully and to observe how the sensation of lying on my chest could change into the sensation of lying on my back. And so I did, slowly and deliberately, and the transition — which I have since undergone many times — is most wonderful. It is like the feeling of slipping from one body into another, and there is distinctly a *double* recollection of the two bodies. I remembered what I felt in my dream, lying on my chest, but returning into my day-life, I remembered also that my physical body had been quietly lying on its back all the while. This observation of a double memory I have had many times since. It is so indubitable that it leads almost unavoidably to the conception of a *dream body*.¹²

Hypnopompic and Hypnagogic States

Between the waking and sleeping states there is a curious hallucinogenic state of consciousness. The state immediately before sleep is termed 'hypnagogic' and the state immediately before full wakefulness is termed 'hypnopompic'. These states are often characterised by vivid imagery that seems totally unrelated to waking

experience or memory. Many readers will recognise some of their own experience of these states in Rawcliffe's description:

The actual forms the imagery takes are, generally speaking, peculiar to this class of hallucination. They are often unnaturally clear and distinct, and many percipients see the scenes and objects presented to their vision as if diffused in a bright light or glow. Pictures, patterns, scenes and places come and go, changing all the while, often too rapidly for proper attention by the intrigued observer. **Some percipients only experience quickly evolving patterns and brightly coloured arabesques.** Others see a continuous series of shifting scenes as if projected by magic-lantern slides. Yet others speak of views and panoramas as if seen from a rapidly moving train. Often reported are bodiless faces shifting kaleidoscopically, occasionally beautiful, sometimes ordinary, frequently grotesque and even horrible, reminiscent of cathedral gargoyles. Few percipients, even among children, mention having been frightened despite the ghoulish appearance of these hallucinatory faces.¹³

The Hypnotic State

A light hypnotic trance is fairly easy to induce in the majority of people. Subjectively, the effect is of relaxation and dreaminess and a kind of lethargy which makes speech and action seem troublesome — they require a deliberate effort of will. **There is a marked increase in suggestibility.** A standard test for the existence of the light trance state is to suggest to the subject that his arms are becoming lighter. They rise up — the subjective impression is that they are being pushed upward by an external agency. **If a hypnotised subject drinks water and is told it is wine, he will get drunk;** if told that he cannot hear the remarks of a particular person, he will become selectively deaf to that person's voice, and so on. The suggestibility can be exploited to implant 'post-hypnotic suggestions' in the subject's subconscious mind, which can be triggered after the subject has returned to the normal state of consciousness, by an appropriate code-word or event; the subject will then produce the suggested action, without being able to account for his anomalous behaviour.

Deeper hypnotic trance states are characterised by an increased vividness of the imaginative faculties, so that hallucinatory experiences can be invoked by suggestion. The subject can re-live past

experiences and even recall details that had been forgotten in the normal conscious state. However, the usefulness of hypnosis as a technique for recovering lost memories is limited by the capacity of hypnotised subjects for fantasising and experiencing the invented fantasies as if they were real.

In the deepest kind of hypnotic state, pain can be eliminated simply by suggestion, so that hypnotism can be employed, and has been successfully employed, on suitable subjects, in place of anaesthetics.

All of these characteristics of the hypnotic state are well-known — though not at all well-understood. One can perhaps summarise by hypothesising that in the hypnotic state the *borderline between conscious and unconscious mental activity* becomes to a certain extent alterable and controllable.¹⁴

Hallucinatory Experience

A hallucination is a perceptual experience that occurs in the absence of any external sensory stimulus. But unlike other internally-generated percepts, such as (non-lucid) dreams, visual imagery or memories, hallucinations have a subjective quality of clarity, immediacy and 'realness' like that of a sensory perception.¹⁵ Any of the senses might be involved; a hallucination can be visual, auditory, olfactory, etc. Hallucinations frequently occur as symptoms of various psychopathologies and brain disorders and they can be induced by drugs. However, it is now generally recognised that they can arise spontaneously in the absence of any psychological abnormality.

In chapter 11 we shall examine some examples of apparitions and of 'miraculous' visionary experiences, which can be classified as hallucinatory, as can many of the reports found in the literature of UFO mythology. In pointing this out, I am in no way implying that the experiences involved are in any way trivial, or that we are not dealing with genuinely mysterious phenomena. There is a tendency to feel that, once a label has been attached to a group of phenomena, some understanding is thereby gained. This is not, of course, the case. Why hallucinations occur, how they are triggered, and their psychological significance, are not at all clearly understood. To regard cases in which percipients have experienced apparitions or visions as satisfactorily 'explained' by dismissing them as 'just hallucinations' is to miss the point.

The belief in fairies, spirits, angels, demons, and other supernatural beings, widespread in an earlier age,¹⁶ and the extensive

folklore and mythology it gave rise to, **may well have had its origin in actual experience.** For example. Evans-Wentz was given the following recollection by T.C. Kermode, a member of parliament of the Isle of Man:

About forty years ago, I and another young man were walking along, talking. My friend happened to look across the river and said, "Oh, look, there are the fairies. Did you ever see them?" **I looked across the river and saw a circle of supernatural light... and into this circle of light, from the surrounding sides apparently, I saw in twos and threes a great number of little beings.**¹⁷

When Kermode struck the wall at the side of the lane with his walking stick, the vision vanished.

In his autobiographical writings, Germany's great poet, playwright, novelist and philosopher, Johann Wolfgang von **Goethe, recorded the following experience,** that happened when he was sixteen. He was on his way to the University of Leipzig from Frankfurt. The passengers were walking alongside the horses, because it had been raining and there was difficulty getting up an incline:

All at once, **in a ravine on the right-hand side of the way, I saw a sort of amphitheatre, wonderfully illuminated.** In a funnel-shaped space there were **innumerable little lights gleaming,** ranged step-fashion over one another; and they shone so brilliantly that the eye was dazzled. But what still more confused the sight was **that they did not keep still, but jumped about here and there,** as well as downwards from above and vice-versa, and **in every direction.** **The greater part of them, however, remained stationary, and beamed on.** It was only with the greatest reluctance that I suffered myself to be called away from the spectacle, which I could have wished to examine more closely... Now whether this was a pandemonium will-o'-the-wisps, or a company of luminous creatures I will not decide.¹⁸

Occasionally, spontaneous **hallucinations can be so weird, so bizarre,** so out of tune with the psychological character of the percipient, that **they seem to be at odds with the conventional view that hallucinations are in every case entirely a product of the subconscious psyche of the percipient.**¹⁹ Here are two examples, to convey something

of the flavour of this outlandish realm beyond the boundaries of 'normal' experience:

On the evening of 3 October 1978, Hideichi Amano of Sayama City, Japan, had driven to a mountain-top with his two-year-old daughter to set up his ham radio equipment. As he was about to drive back after having completed his transmission, the interior of the car in which he was sitting suddenly lit up brilliantly, as if a fluorescent tube were inside it. Amano was horrified to see that his daughter was lying on the seat beside him, apparently unconscious and foaming at the mouth. At the same instant an orange beam of light was directed on to him — seeming to come from a source in the sky, and he felt something metallic pressing against his right temple. He then saw a terrifying apparition outside the car: a humanoid creature with a round head, motionless eyes that glowed with a bluish light, no nose, sharply-pointed ears, and a triangular depression on its forehead. The mouth was clamped around a kind of pipe — it was the other end of this that was pressing against Amano's head, and an incessant babble emanated from it, "like a tape played too fast." Amano found it difficult to move and his mind became 'vague'. The utterly terrified man tried to start the car to get away, but it would not start. After what seemed like four or five minutes, the creature faded away and vanished, and then the lighting returned to normal. The car then did start, and Amano sped back down the hill in shock and confusion. His little daughter was none the worse; she turned to him and asked for a drink of water. When Amano tried to report the occurrence to the police, they laughed at him. On reaching home he went to bed with a severe headache. The investigator Junichi Takahashi, after interviewing Amano, concluded that the encounter was a genuine experience, and "one of the strangest ever to have taken place in Japan".²⁰

Our second example took place in a British army barracks in Cyprus, in September 1968. 'Ken', an officer who occupied a private room at the head of the stairs, was sleeping with his dog beside his bed, when he was awakened at 3am by the dog's growling. The dog refused to respond when he called his name; its fur was standing on end — it was obviously very frightened. "It began crying and shaking and then crawled under my bed." Ken then detected a faint but penetrating high-pitched noise — presumably the sound was much more intense above the range of human hearing, and this was what was terrifying the dog. He opened the door to try to locate the source of the noise, and to his horror saw something coming up the stairs:

The thing was just coming into view half way up the steps with its head visible through the bars that lined the stairwell. Its head was covered in red hair which was rough and about four inches long and stuck out in all directions. As it came higher and more came into view it became obvious that it wasn't moving normally, i.e. not taking the steps but apparently *floating* up. By this time all the head and neck was in full view and the head started to rotate towards me. The movement was completely unnatural, because the head turned too far and stayed perfectly level. The chin came right past the left shoulder.

The creature was dressed in some kind of one-piece light-blue garment. Its face was flat and orange. Its eyes were very large and very red, and they were looking directly at Ken. He shut the door in utter panic and bolted it. The high-pitched noise had intensified and become intolerable. The dog was in an uncontrollable fit of shaking and whimpering.

I sat on my bed facing the door and was in very deep shock, shaking so much that my joints felt as if they were clattering about and my feet kept leaving the floor. I then became aware of a sliding sound approaching the door.

Ken grabbed an underwater speargun and with the strength that comes from desperation managed to load it — an operation that usually is impossible without wedging the weapon against a rock — and picked up his diver's knife. He then sat for many minutes, holding the weapons and facing the door, feeling completely helpless, listening as the sliding noises moved about outside the door. Finally they receded and the high-pitched sound ceased. Ken collapsed exhausted and lay on the bed until the guard arrived an hour later to give his early morning call. The guard had seen and heard nothing and was baffled by the weapons, and the state he found Ken in. The dog, a wolfhound who had been brave and fearless before the occurrence, never recovered — it became a timid and nervous creature.²¹

Mystical States

As he journeyed, he came to Damascus: And suddenly there shined round about him a light from heaven: And he fell to the

earth, and heard a voice saying unto him, Saul, Saul, why persecutest thou me? And he said, who art thou Lord? And the Lord said, I am Jesus whom thou persecutest: it is hard for thee to kick against the pricks. And he, trembling and astonished, said, Lord, what wilt thou have me do? and the Lord said unto him, Arise, and go into the city, and it shall be told thee what thou must do. And the men which journeyed with him stood speechless, hearing a voice, and seeing no man.²²

Saul remained blind for three days after this vision. Thereafter, he was a changed man. From being a fanatical persecutor of the early Christians, he was transformed into their charismatic leader. Under his new name Paul he was a major influence in the shaping and propagating of the thought-patterns that were to become the foundations of European civilization for the next two thousand years.

States of consciousness profoundly different from the normal waking state have been reported throughout history by saints and mystics. The way these *mystical states*²³ are reported by those who have experienced them are, inevitably, overlain by interpretation in terms of religious and cultural preconceptions, but the essential features of the actual experiences that gives rise to these verbal outpourings are remarkably consistent. It is of course impossible to convey in verbal descriptions the quality or value of subjective feelings to individuals who have never themselves experienced them. The mystical experience has this in common with states of feeling — it is 'ineffable'. The mystic is thus in a position rather similar to that of a music-lover faced with the incomprehension and scepticism of the tone-deaf. The aura of feeling that characterises mystical states is reported to be one of transcendent bliss, of utter peace — 'the peace that passeth understanding' of St. Paul. But the mystical states are more than states of profound feeling, they are experienced also as a source of profound insight, as a revelation of inexpressible truths, as enlightenment:

Although so similar to states of feeling, mystical states seem to those who experience them to be also states of knowledge. They are states of insight into depths of truth unplumbed by the discursive intellect. They are illuminations, revelations, full of significance and importance, all inarticulate though they remain; and as a rule they carry with them a curious sense of authority for aftertime.

— Wm. James²⁴

One day, being in orison, it was granted to me to perceive in one instant how all things are seen and contained in God. I did not perceive them in their proper form, and nevertheless the view I had of them was of a sovereign clearness, and has remained vividly impressed upon my soul. It is one of the most signal of all the graces which the Lord has granted me... The view was so subtle and delicate that the understanding cannot grasp it.

— *St. Teresa of Avila* ²⁵

Mystical states can arise after long and patient meditation or prayerful contemplation, as is abundantly evident in the traditions of many cultures. The Indian meditation techniques of Yoga, and the Zen Buddhist meditation, or za-zen, are well known. Ancient Chinese techniques are set forth in *The Secret of the Golden Flower*²⁶, which in printed form originated in the seventeenth century, though the traditions on which it is based may have their origins as early as the eighth century. *The Cloud of Unknowing*²⁷ is a remarkable work by an unknown English priest of the fourteenth century, full of kindly and wise advice to a follower of the contemplative life. The transition to the mystical state of consciousness has often been described:

The heavenly rain often comes down when the gardener least expects it. Yet it is true that at the beginning it always comes after long mental prayer. Then, as one stage succeeds another, the Lord takes up this small bird and puts it into the nest where it may be quiet. He has watched it fluttering for a long time, trying with its understanding and its will and all its strength to find God and to please Him; and now He is pleased to give it its reward in this life. And what a reward! One moment of it is enough to repay all the trials it can ever have endured.

— *St. Teresa of Avila* ²⁸

One may start a process of one kind or another for the purpose which would normally mean a long labour and be seized, at the outset, by a rapid intervention or manifestation of Silence with an effect out of all proportion to the means used at its beginning. One commences with a method, but the work is taken up by a Grace from above, from That to which one aspires or an irruption of the infinitudes of the Spirit. It was in

this last way that I myself came by the mind's absolute silence, unimaginable to me before I had its actual experience.

— *Sri Aurobindo* ²⁹

Mystical states can also arise spontaneously and unexpectedly. In some instances they seem to arise from a compensatory mechanism of the mind, as a reaction against the despair engendered by intolerable circumstances. This seems to have been the case, for example, in Koestler's mystical experience, which marked a turning-point in his attitude to life and which came while he was imprisoned in a Spanish jail awaiting an expected death sentence:

... A wordless essence, a fragrance of eternity, a quiver of the arrow in the blue. I must have stood there for some minutes, entranced, with a wordless awareness that 'this is perfect — perfect'... ³⁰

In other instances, mystical states appear to arise from a heightening, an escalation, of an *aesthetic* experience — a component that was also present in Koestler's case; his mystical experience followed immediately from his contemplation of the elegance of a mathematical theorem. The following experience was preceded by the soothing effect of 'the loveliness of the morning, and the beauty of the hills and the valleys':

...suddenly, without warning, I felt that I was in Heaven — an inward peace and joy indescribably intense, accompanied with a sense of being bathed in a warm glow of light... a feeling of having passed beyond the body, though the scene around me stood out more clearly and nearer to me than before, by reason of the illumination in the midst of which I seemed to be placed. The deep emotion lasted, though with decreasing strength, until I reached home, and for some time after, only gradually passing away. ³¹

There is a sceptical response to this whole realm of human experience that seeks to explain it in terms of brain dysfunction. ³² Temporal lobe epilepsy, for example, can trigger mystical states of consciousness. Mystical states are also asserted to be experienced by sufferers from mental illness, the symptoms of which are religious manias and bizarre delusions. Persinger has shown that artificial stimulation of the temporal lobes can evoke

intense meaningfulness and peak experiences; the latter are often in conjunction with altered body perceptions such as out-of-the-body experiences... or convictions of cosmic consciousness.³³

This is all very interesting and provides insight into the neurophysiology associated with subjective experience. But the cynical conclusion that the subjective experience itself is thereby rendered invalid and trivial would be totally unwarranted. The fact that mystical states can be triggered artificially or induced by pathological conditions tells us nothing about their role and significance in the *natural* functioning of the psyche.³⁴ The cynical conclusion ignores completely the evident *life-enhancing* quality of naturally-occurring mystical experience for those who are fortunate enough to have glimpsed it — a quality that stays with the subject as a treasure, long after the short-lived experience is over. It ignores the fact that mystical states can be entered by quiet contemplation and the stilling of the mind's habitual restlessness. It ignores the fact that mystical states are *not only* triggered by unnatural brain instabilities, they are also triggered in many instances by the simple joy and delight in the beauty of the natural world. It ignores the fact that some of the most sublime achievements of the human mind, from the splendour of gothic cathedrals to the delicacy of Sufi poetry, have their roots in mystical experience.

Faced with these facts, what is required is not facile debunking 'explanations' drawn from psychopathology, but a deeper understanding of the range of experiences available to consciousness and an understanding of their meaning and significance. The mystery behind the fact that mental states can be triggered artificially by stimulation of the brain is that these states of mind *are there to be triggered*. The facts tend to suggest, not that mystical states are pathological, but that the desire to trivialise them is, and that what we call our 'normal' state of waking consciousness may be in some sense subnormal.³⁵

When the heart is hard and parched up, come upon me with a shower of mercy.

When grace is lost from life, come with a burst of song.

When tumultuous work raises its din on all sides shutting me out from beyond, come to me, my lord of silence, with thy peace and rest.

When my beggarly heart sits crouched, shut in a corner, break
open the door, my king, and come with the ceremony of a
king.

When desire blinds the mind with delusion and dust, O thou
holy one, thou wakeful, come with thy light and thy thunder.

— *Rabindranath Tagore* ³⁶

Psychedelic Experience

There are a large number of substances whose interference with brain chemistry produces strange mental states, which may include intense hallucinatory visions and experiences resembling (or perhaps identical with) mystical states.³⁷ ‘Mind-expanding’ drugs have been employed by various societies for centuries, perhaps for millennia, in initiatory rituals of a religious nature. Examples are the hallucinogenic mushroom *Amanita muscaria* (fly agaric) used by the shamans of Siberia for entering into a visionary trance state, the Mexican peyotl obtained from the cactus *Anhalonium Lewinii*, and the leaves and shoots of hemp, *Cannabis sativa*, used during religious festivals in parts of India where it is known as ‘bhanga’ — elsewhere known as hashish or marihuana. In addition to the numerous naturally-occurring substances that produce peculiar mental states, there are various artificially-synthesised drugs with mind-altering properties, of which the most well-known is LSD.

The subjective effects of each of these substances vary widely, depending as they do on the personality structure and mental attitude of the user. Traditionally, ‘mind-expanding’ drugs have been associated with religious sacraments. The induced subjective state had a social context. The *numinous* quality of the induced experience in these circumstances renders its closeness to ‘mystical’ states likely. On the other hand, an ‘unsuitable’ frame of mind, a state of anxiety or a bad mood, can give rise to a ‘bad trip’ during which the user is plunged into a nightmarish experience — a hell rather than a heaven.

Reports of the dramatic effects on subjective experience of alterations in brain chemistry have their parallels in the mental states induced by ritual practices such as fasting, rhythmical drumming or chanting, meditational techniques, and so on.³⁸ These techniques are associated with chemical changes in the brain — the brain is capable of manufacturing its own hallucinogenic and mind-expanding drugs. One might mention in this connection the use of drugs in the treatment of mental illnesses. In all these instances we are dealing with the relationship between brain chemistry and subjective experience (a field

of exploration that is still very poorly understood (and which, incidentally, has no analogue in the field of artificial intelligence).

Aldous Huxley's experiment with mescaline, the active ingredient in peyotl, is well-known. The lucidity, rationality and precision of his faculties of observation were retained throughout. The change he describes was one of amazing enhancement of the intensity of aesthetic response to everything he looked at:

That chair — shall I ever forget it? Where the shadows fell on the canvas upholstery, stripes of a deep but glowing indigo alternated with stripes of an incandescence so intensely bright that it was hard to believe that they could be made of anything but blue fire. For what seemed an immensely long time I gazed without knowing, even without wishing to know, what it was that confronted me... the percept had swallowed up the concept. I was so completely absorbed in what I saw, that I could not be aware of anything else. It was inexpressibly wonderful, wonderful to the point, almost, of being terrifying. And suddenly I had an inkling of what it must feel like to be mad...

Confronted by a chair that looked like the Last Judgement — or, to be more accurate, by a Last Judgement which, after a long time and considerable difficulty, I recognized as a chair — I found myself all at once on the brink of panic. This, I suddenly felt, was going too far. Too far, even though the going was into intenser beauty, deeper significance.

— Aldous Huxley³⁹

My own experiment with 'bhang' was as amazing, but in a different way. The effect lasted about three hours and consisted of four periods of profoundly altered states interspersed with more normal states resembling a light hypnotic trance. Each of the four phases had its own peculiar character. The earliest phase was simply a feeling of relaxation and contentment, and a desire to giggle, combined with an odd acoustic effect that made my voice sound 'out of synchronisation'. In the second phase this acoustic effect became more severe and made talking difficult; it revealed itself to be a disruption of my *sense of the passage of time*; some seconds seemed to be stretched out, subjectively, to a long time, while others were contracted to mere instants — and the effect was rhythmical, wavelike. This was most apparent when walking about; the memory of the action was peculiarly jerky, like a film stopping and starting. Coherent speech became impossible because I

seemed to be carried along by the flow of time in the middle of sentences, without having time to complete them. The disruptions in the perception of time made it hard, the following day, to recall the *sequence* of my experiences. In the third phase,

...the rhythmical shifts in time perception are now rapid. Attention to objects cannot be held, it switches from one perceived object to another in a flickering way. I feel that this time the effects are going to be more profound, and as I think this, the *thought* itself is rapidly wrenched and shifted. Each transitory thought seems to set up echoes, to *reverberate*. Yet 'I' seem to be calmly separate from the thoughts and their rapid transformations, the multiple reflections of each thought. Perceptions and thoughts are undergoing rapid, fluttering, dancing transformations, yet, surprisingly, I am able to 'objectively' observe it all. I observe myself standing stock still in amazement saying things like "It's so marvellous, it's so fascinating!"

In the final, profoundest, phase

...transformations and transpositions of thoughts and visual impressions are now *very* rapid, very bewildering, but also exhilarating. Every thought, immediately it begins, sets off a reverberating sequence of associations, so fast that I can't keep up with them. Yet it all seems ordered and harmonious, like snatches of intricate bewitching music. I am extremely happy, delighted by the intricately ordered play of fleeting thoughts, feelings and impressions — complex patterns of shifting, multiply-reflected and refracted thoughts. The 'ordered disorder' of my thoughts seems imbued with subtle meanings. I am flooded with impressions in vast orchestrated arrays, and hope desperately that I will be able to hold on to the memory of this wonderful experience. What a pity that I will never be able to explain to anyone experiences that are inexpressible in words, and maybe I won't even remember — amazingly, I am able to speak, and say this to my companion. The fascination with what is going on in my mind becomes so intense, it changes into an overwhelming joy. Every thought, every visual impression, sparks off glittering sequences of fleeting, dancing, ecstatic states of mind that are simultaneously like sublime music, like revelatory

philosophical discourse and like profound intuitions. I feel the experience to be immensely valuable and precious and that I *must* retain as much as possible when I return to normality. But how to hold on to it? It is so much — it is *too* much. All these thoughts are immediately taken up and woven into the infinitely subtle tapestry of impressions. All is so shifting, so subtle, so elusive. I feel all at once to be in possession of a great illumination and close to some ultimate revelation that will make sense if only I can hang on to it. The fascination, the amazement and joy grow and grow until I pass into a state of calmness and bliss, a kind of ‘religious’ awe, and am close to tears of joy. So *this* is it! This is what the saints and mystics have seen! Now I *know*! I suddenly recall that all this has been revealed to me *by a leaf* — it is a delusion. Yet, as soon as this thought occurs to me, it is taken up and incorporated into the unfolding miracle — even *this* thought! Here is a divine paradox. I think: now I know why Zen monks love paradox, now I know why Zen sages are depicted laughing — enlightenment means seeing the cosmic joke. I feel like laughing from sheer joy. Meanwhile, the ever more intricate patterns of fleeting thought continue to be a source of fascination, and I keep repeating: “it’s all so *subtle*, so subtle. And so elusive.” How to hold it and keep it?

The above notes were jotted down the morning after the experience, after a good night’s sleep, while the impressions were still fresh and vivid. Throughout the day, I felt unusually contented and carefree, as if some habitual tension had been relaxed. Listening to piano music had a strange *nostalgic* quality; it seemed to call up echoes of the previous evening’s strange experience and I appreciated the music far more than usual.

The motivation for the experiment was, from the outset, a desire to *observe*, to see for myself what an ‘indescribable’ altered state is like. This attitude probably accounts for the retention of some degree of lucidity as a rational observer. Huxley’s lucidity was similarly retained under the influence of mescaline. A profound passage in the Katha Upanishad speaks of two birds in the same tree; one enjoys the fruits while the other looks on. The feeling of blissfulness seemed to be related to the normal, healthy feeling of delight, differing from it only in its intensity, not in kind; the amazing impression that ultimate revelations are taking place seemed related to the normal experience of suddenly understanding something — differing from it only in intensity

and duration; the feeling of meaningfulness and significance, it seems to me, *was a more intense form of the normal feeling that life is full of meaning*. As for the insistent feeling that remembering the experience was of the utmost importance, I would maintain that that was no delusion. It arose from my motivation for the experiment — to find something out. I would maintain that knowledge imparted by direct experience of an unusual region of one's inner realm, even though it may be incommunicable, is valuable knowledge nevertheless.

In describing the effects of hashish, Baudelaire emphasised that, though the experience is dreamlike in the intensity of its colours and the rapidity of conceptions, the peculiar tonality of the subject's personality is maintained. The influence of attitude and motivation on the quality of the hashish experience is evident in Baudelaire's description:

The idler has contrived to introduce the supernatural into his life and his thought, artificially. But in spite of the eventful energy of his sensations, *he is only the same man augmented, the same number raised to a very high power*. He is overcome; but, to his dismay, *he is overcome only by himself*, that is to say, the part of himself already dominant. *He had wanted to become an angel, he has become a beast*, momentarily very powerful, if an excessive sensibility without the control needed to moderate it or exploit it can be called power.

— Charles Baudelaire ⁴⁰

There is a rare condition known as synesthesia,⁴¹ in which conscious apprehension of different types of sensory perception do not have their usual exclusiveness. Individuals with this condition are not 'mentally ill', but they do have brains that function in an unusual way. Their conscious experience lacks some of the boundaries that usually separate different perceptual modes; they may experience shapes associate with tastes, *they may 'hear' colours or 'feel' sounds, for example* — experiences that are scarcely imaginable for 'ordinary' minds. Synesthetic characteristics are apparent in Baudelaire's descriptions of hashish-induced states, thus suggesting that synesthesia may be a component of the normal operation of the human mind that takes place below the level of consciousness and is experienced consciously only by naturally synesthetic individuals or in drug-induced states of mind of the kind described by Baudelaire:

The hallucinations commence. External objects take on a monstrous appearance. They reveal themselves to you in forms previously unknown. Then they deform, transform, and finally enter into your being, or rather you enter into them. The most singular ambiguities, the most inexplicable transformations of ideas take place. Sounds have a colour, colours have a music. Musical notes are numbers, and you resolve prodigious arithmetical calculations with an alarming rapidity as the music unrolls in your ears. You are sitting and you are smoking; you believe yourself to be sitting in your pipe, and it is you that your pipe is smoking; it is yourself that you exhale in the form of bluish clouds.

— *Charles Baudelaire* ⁴²

Thomas de Quincey has described some of the weird and intensely vivid dreams that resulted from his addiction to opium. The imagery and emotional content of these dreams was at first a delight, but after he had become dependent on the drug they changed their character, becoming menacing and horrific. The fantastic architectural imagery of his early visions are very strikingly similar to hallucinatory experiences reported by others — they seem to be characteristic of a class of altered states of consciousness:

In the early stages of my malady, the splendours of my dreams were indeed chiefly architectural: and I beheld such pomp of cities and palaces as was never yet beheld by the waking eye, unless in the clouds.

— *Thomas de Quincey* ⁴³

De Quincey quotes from a poem of Wordsworth to illustrate the nature of this visionary experience:

The appearance, instantaneously disclosed,
Was of a mighty city – boldly say
A wilderness of building, sinking far
And self-withdrawn into a wondrous depth,
Far sinking into splendour – without end!
Fabric it seemed of diamond, and of gold,
With alabaster domes, and silver spires,
And blazing terrace upon terrace, high
Uplifted; here, serene pavilions bright
In avenues disposed; there towers begirt

With battlements that on their restless fronts
Bore stars – illumination of all gems!

— Wordsworth ⁴⁴

It is interesting to compare this imagery with the following passage from Arthur Machen:

... for many years I had kept by me an article from the *Lancet* or from the *British Medical Journal* — I forget which — in which a doctor gave an account of certain experiments he had conducted with a drug called the Mescal Button, or Anhelonium Lewinii. He said that while under the influence of the drug he had only to shut his eyes, and immediately before him there would rise incredible Gothic cathedrals, of such majesty and splendour and glory that no heart had ever conceived. They seemed to surge from the depths to the very heights of heaven, their spires swayed amongst the clouds and the stars, they were fretted with admirable imagery. And as he gazed, he would presently become aware that all the stones were living stones, that they were quickening and palpitating, and then they were glowing jewels, say, emeralds, sapphires, rubies, opals, but of hues that the human eye had never seen.

— Arthur Machen ⁴⁵

Aldous Huxley quotes from Weir Mitchell's account of the visions he saw while under the influence of peyotl:

... Buildings now made their appearance, and then landscapes. There was a Gothic tower of elaborate design with worn statues in the doorways or on stone brackets. 'As I gazed, every projecting angle, cornice and even the faces of the stones at their joinings were by degrees covered or hung with clusters of what seemed to be huge precious stones, but uncut stones, some being more like masses of transparent fruit... All seemed to possess an interior light.' The Gothic tower gave place to a mountain, a cliff of inconceivable height, a colossal birdclaw carved in stone projecting over the abyss, an endless unfurling of coloured draperies, and an efflorescence of precious stones.

— Aldous Huxley ⁴⁶

The visionary painter Ernst Fuchs⁴⁷ captures in painting something of the essence of this kind of extraordinary imagery from what Huxley calls 'the mind's antipodes.' In his book *Architectura Caelestis*⁴⁸ Fuchs draws attention to the repeated appearance of 'heavenly architecture' in the work of visionary artists. He postulates the existence of 'the forgotten style' (der verschollene Stil) that is *archetypal* in the Jungian sense, having a discernible formative influence on the creative artistic activity of the human mind.

The delightful quality of de Quincey's visionary states gave way, gradually and insidiously, to terrifying nightmare visions and states of

... deep-seated anxiety and gloomy melancholy, such as are wholly incommunicable in words. I seemed every night to descend, not metaphorically, but literally to descend, into chasms and sunless abysses, depths below depths, from which it seemed hopeless that I could ever re-ascend. Nor did I, by waking, feel that I *had* re-ascended...

The sense of space, and in the end, the sense of time, were both powerfully affected... Space swelled, and was amplified to an extent of unutterable infinity. This, however, did not disturb me so much as the vast expansion of time; I sometimes seemed to have lived for seventy or a hundred years in one night; nay, sometimes had feelings representative of a millennium passed in that time, or, however, of a duration far beyond the limits of any human experience.⁴⁹

De Quincey confesses that he had always experienced a peculiar irrational repulsion for all things 'oriental'. The ancient civilizations of Egypt, India and China seemed to him incomprehensible, and their strangeness terrified him. This prejudice appears to have been heightened to a pathological level by the psychic effect of opium; terrifying 'oriental' themes and images came to dominate his nightmares:

I was stared at, hooted at, grinned at, chattered at, by monkeys, by paroquets, by cockatoos. I ran into pagodas: and was fixed, for centuries, at the summit, or in secret rooms; I was the idol; I was the priest; I was worshipped; I was sacrificed. I fled from the wrath of Brama through all the forests of Asia: Vishnu hated me: Seeva laid wait for me. I came suddenly upon Isis and Osiris: I had done a deed, they said, which the ibis and the crocodile trembled at. I was

buried, for a thousand years, in stone coffins, with mummies and sphynxes, in narrow chambers at the heart of the eternal pyramids. I was kissed, with cancerous kisses, by crocodiles; and laid, confounded with all unutterable slimy things, amongst reeds and Nilotic mud.

— *Thomas de Quincey*⁵⁰

Conclusions

The psychological and physiological dangers of prolonged or excessive use of chemical means for extending the normal range of subjective experience are emphasised in the writings of de Quincey and Baudelaire. Huxley, on the other hand, was convinced that the moderate use of mescaline for exploring the mind is devoid of deleterious effects, and others have made similar claims for marihuana and LSD. Nevertheless, the serious nature of the present worldwide problem of drug addiction puts severe ethical and legal constraints on this kind of psychological investigation. However, a large body of information on drug-induced experiences *already* exists. When one adds to this data the results of investigations into altered states of consciousness arising from meditation, into hypnotic states and other trance states such as those of shamanic lore and tradition, and the whole range of conscious experience that is alleged to be ‘paranormal’, one finds there is an enormous range and depth of subjective experience, forming a continuum co-extensive with the already immense and subtle range of ‘ordinary’ states of consciousness. One is faced with the intellectual task of systematising this realm of subjective experience; one is faced with the task of evolving a ‘science of consciousness’.

An adequate science of consciousness, or, what amounts to the same thing, a science of subjective experience, would aim to understand and clarify the *significance* of subjective experience — a fundamental problem that the reductionist viewpoint, with its emphasis on ‘mechanisms’ and ‘objectivity’, has pushed aside.

Conscious experience *is* reality. Or, more precisely, it is the only kind of reality we can have any inkling of. Understanding the nature of reality is therefore the same thing as understanding conscious experience. The traditional emphasis, in ‘scientific’ investigation, on particular kinds of conscious experience — namely, the experience of sensory perception, especially that of the scientist in his laboratory, and the intellectual experience of formulating theories to systematise sensory perception and extract ‘objective’ knowledge from it — provides understanding of a portion only of subjective experience,

leaving out of account much of its richness and range. In leaving out of its account of reality a large portion of what human minds actually experience, science thus leaves significant aspects of reality outside its boundaries.

Notes and References

1. King 1963; Tart 1969; 1975; Pope and Singer 1978; etc.
2. Myers 1903, 1961. William James has drawn attention to Myers' proposal, in James 1902 (1961 edn, p.396) and cited also Myers' article in Proc. Soc. Psychical Research 42, 1909: 'How important this exploration will prove, future work upon the path which Myers has opened up can alone show.'
3. See for example Woodcock, A. & Davis, M., Catastrophe Theory, Penguin 1980, chapter 9.
4. See Clark 1983 and references to earlier attempts at mathematical models cited therein. Clark's model is in fact a topological model presented in a misleading way that makes it look metrical. The idea of metrical properties of the continuum of mental states is suggestive, in the sense that mental states can be 'close' to each other or more 'distant', but these essentially qualitative notions can probably not be meaningfully quantified.
5. van Eeden 1913, 1918; Malcolm 1962; Green 1968b; Lee & Mayes (eds) 1973; Coxhead & Hiller 1976; Evans & Evans 1983; Inglis 1988.
6. Oswald 1962; 1970.
7. Evans & Evans 1983.
8. *ibid.*
9. Crick, F. & Mitchison, G., The function of dream sleep, Nature 304, 1983, p.111.
10. Inglis 1988, p.41.
11. Green 1968b.
12. van Eeden 1913; Wilson 1986, p.267.
13. Rawcliffe 1952, 1959, p.125.
14. Dingwall 1968; Shapin & Coly (eds) 1978.
15. Society for Psychical Research 1894; West 1962; Siegel & West (eds) 1975; Evans 1987; Siegel 1992.
16. Kirk 1691; Yates 1859, 1982; Evans-Wentz 1911, 1966; Vallée 1985.
17. Evans-Wentz 1994, p.133.
18. Quoted by Vallée 1985, p.21.
19. Bowen 1969; Keel 1976b; Brookesmith (ed.) 1984; Randles 1990.
20. Brookesmith (ed.) 1984b, p.64.
21. Brookesmith (ed.) 1984c, p.56; Randles 1990, p.75.
22. Acts 9: 3-7.
23. James 1902, 1961, chapters 16 & 17; Otto 1932, 1962; Allen 1946; Underhill 1955; Suzuki 1957; etc.

24. James 1902, 1961 edn p.300.
25. James 1961, p.323.
26. Wilhelm, Richard (transl.) *The Secret of the Golden Flower*, Kegan Paul, Trench & Trübner, London 1931; Arkana, London 1984. Commentary by C.G. Jung.
27. **The Cloud of Unknowing and Other Works**, translated into modern English by C. Wolters. Penguin 1961.
28. Happold 1963, p.321.
29. Sri Aurobindo on Himself and on the Mother, Sri Aurobindo Ashram Trust, Pondicherry 1953.
30. Quoted by Wilson 1988, p.133.
32. J. Trevor, quoted by James 1902; 1961 edn p.132.
33. Beyerstein, B.L., *Skeptical Inquirer* 12(no.3), 1988, p.248.
33. Persinger, M., Religious and mystical experiences as artifacts of temporal lobe function: a general hypothesis, *Perceptual & Motor Skills* 57, 1983, p.1255.
Persinger, M., People who report religious experiences may also display advanced temporal lobe signs, *Perceptual & Motor Skills* 58, 1984, p.963.
34. A survey indicating that as many as one person in three claims to have had some kind of 'religious' or mystical experience makes the 'explanation' of all cases in terms of brain dysfunction seem unlikely: see Hardy 1979 (cited by Wilson 198, p.45). Trivialisation of mystical experience as 'an artifact of temporal lobe function' is in reality no different from trivialising all experience as an 'artifact' of brain function. It is the epiphenomenalism on which such trivialisations are based that is called into question by the very existence of conscious experience.
35. **This theme was explored in Colin Wilson's first book The Outsider** (1958). He has returned to it again and again in his prolific later writings. That the existence of mystical states may have implications concerning the further evolution of mind and consciousness is stressed in the mystical writings of Sri Aurobindo. For a biography of this remarkable man and an introduction to his thought and mystical experience, see Satprem 1968, and Aurobindo's magnum opus, *The Life Divine*, 1914-19, 1970.
36. Tagore, *Gitanjali* 1913; Macmillan India 1973.
37. Baudelaire 1860, 1961; Klüver 1928, 1966; Tart 1969; Huxley 1971; Nahal (ed.) 1971.
38. Tart 1969; Guiley 1991.
39. Huxley 1964, 1971 edn pp.44, 46.
40. Baudelaire 1860, 1961 edn p.108.
41. Cytowik 1992.
42. Baudelaire 1961, p.121. This 1961 edition contains Baudelaire's shorter essay, *Du vin et du hachich*, and **three essays by Théophile Gautier**: *Le pipe d'opium*, *Le hachich*, and *Le club des hachichins*.
43. de Quincey 1821; 1985 edn p.71.

44. Wm. Wordsworth: The Excursion.
45. Arthur Machen, The Great Return: in Tales of Horror and the Supernatural, Richards Press, London 1949.
46. Aldous Huxley, Heaven and Hell: in Huxley 1971, p.81.
47. Fuchs 1977.
48. Fuchs 1973.
49. de Quincey 1821, 1985 edn p. 68.
50. *ibid.*, p.73.

8 CONSCIOUSNESS

Attention and Concentration

I have already alluded to the elusive nature of consciousness, to how it seems to lie outside any rational paradigm. Behaviourism ‘solved’ the problem by the simple expedient of denying ‘consciousness’ access to the society of concepts worthy of consideration. Materialistic paradigms regard it as some kind of epiphenomenon arising out of the mechanistic actions of matter, but leave us completely in the dark as to the nature of the epiphenomenon and the kind of mechanistic actions needed for it to ‘emerge’.

Of course, the mysterious nature of consciousness itself does not preclude investigation and discussion of phenomena associated with it. The contents of consciousness (thoughts and sensations) and states of consciousness (emotions and moods) come in for a great deal of discussion in cognitive psychology.¹ These contents and states constitute the whole of our experience. Consciousness is what is *having* the experiences; it is the ‘I’ in Descartes’ ‘I think, therefore I am.’ As we have seen, materialistic philosophical systems suggest no reason why consciousness should exist at all; in these systems it is simply an irrelevant passive observer taking no part in the causal stream of events.

That we *feel* that we have free will is an incontrovertible fact — it *seems* to us that we consciously direct our thoughts and actions, that they are not entirely determined by external events. Materialistic philosophical systems have no recourse but to insist that this really is only a ‘seeming’ — an illusion — and that there is some kind of conspiracy whereby consciousness, itself an epiphenomenon of brain activity, is continually being deceived into feeling that it is taking an active part.

This is all very odd. The alternative hypothesis, that consciousness does in fact take part in the play of events — and, consequently, that the materialistic view is wrong — might be true. Let us consider what evidence there is in support of this hypothesis. First, consider some of the varieties of brain action in which consciousness is *not* involved, even as a passive observer. At any one time, consciousness is associated with only a small portion of brain activity. One can be aware of only a few things (thoughts and sensations) simultaneously. Most of what the brain is doing is not accessible to

consciousness. Think of a musician playing an instrument — is she aware of all the muscular activity of every finger, the whole time? No, of course not — these mechanical details are left to the capabilities of unconscious brain activity. Even when walking along a street, we are not usually conscious of the pressure of the ground on the soles of our feet, nor of the complex muscular actions brought into play at every step. When conversing we are hardly aware of all the searching and finding of appropriate words with which to express our ideas and concepts, let alone the gymnastic activities of the lips, tongue and larynx! The brain is dealing with these things but does not draw them to the attention of the conscious mind. We are not *paying attention* to them.

Thus, the conclusion that we are automatons is at least partially right. We are indeed automatons when our actions are based on thoroughly practised skills or firmly rooted habits. Other obvious examples of brain activity that does not impinge on consciousness are the mechanisms of perception (the elaborate information-processing done, for example, by the visual cortex, the end result of which finally emerges into consciousness ‘simply’ as *seeing*) and the myriad tasks carried out by the brain in monitoring and regulating respiration, digestion, blood pressure and many other processes.

A great deal of unconscious mental activity is involved when we are engaged in a skill that has been thoroughly acquired. In Zen Buddhism the highest level of achievement in the arts is asserted to be performance that involves no mental effort at all — by which is meant no *conscious* mental effort. Such a state is reached after many years of constant diligent practice.² The process of acquiring a skill in the first place is a different matter. When we are called upon to deal with something unfamiliar, we need to *concentrate*. In order to learn effectively, *attention has to be directed* to the matter in hand. The brain activity dealing with the unfamiliar new skill is predominantly *conscious* activity. Only when, through repetition and practice, a greater level of proficiency is achieved, can the skill be exercised with less attention. Only thoroughly acquired skills can be exercised automatically, that is, unconsciously. Driving a vehicle, for example, can become largely an unconscious mental activity. Only when something *unexpected* crops up is consciousness again involved — the driver is obliged to ‘pay more attention’. It is as though the automatic operations of the brain call upon consciousness for help when a situation arises that they cannot handle without the aid of conscious attention.

These familiar empirical facts of subjective experience would be very difficult to reconcile with the materialist idea that consciousness has no active role. They strongly suggest that consciousness does indeed contribute to the causal stream of events; they suggest that consciousness *directs attention*, and *focuses attention* when we concentrate.

The materialist paradigm is obliged to regard ‘attention’ and ‘concentration’ as some kind of epiphenomena of the computer-like functioning of the brain at its highest levels of complexity. This view seems to be inconsistent with the elementary observation that the mental processes associated with consciousness are often not conspicuously complex — for instance, when we are simply sitting, thinking of nothing in particular, we *remain conscious* — whereas even some of the most subtle and remarkable capabilities of the mind — major scientific insights, the solution of difficult problems, artistic creativity — sometimes take place largely at an *unconscious* level; consciousness receives the results of these unconscious mental activities as more or less spontaneous ‘inspirations’.

... unconscious activity often plays a decisive part in discovery; that periods of ineffective effort are often followed, after intervals of rest or distraction, by moments of sudden illumination; that these flashes of inspiration are explicable only as the result of activities of which the agent has been unaware — the evidence for all this seems overwhelming.

— *Jacques Hadamard*³

The structure of the mind or psyche can be thought of in terms of a picturesque metaphor. ‘Attention’ is like a spotlight. Its beam may be broad and dim, or narrow and bright. We are conscious of whatever is in the spotlight. An act of concentration makes the beam narrow and bright. The light can be moved around. It can be directed ‘outwards’ to immediate perceptions of the external world or ‘inward’ to thoughts, feelings and memories. It can be moved only over a limited region. This region is the conscious mind. Around it is the darkness that the light of attention cannot normally reach. The region of darkness is the unconscious mind. It is an unknown world; things can emerge out of it into the spotlight, as in dreams, sudden inspirations, unaccountable moods, and, more rarely, hallucinations and so-called ‘paranormal’ perceptions.

Every man contains within himself a ghost continent — a place circled as warily as Antarctica was circled two hundred years ago by Captain James Cook. If, in addition, the man is a scientist, he will see strange shapes amidst his interior ice floes and be fearful of exposing to the ridicule of his fellows what he has seen.

— Loren Eiseley⁴

Animal Consciousness

The legacy of the negative aspects of behavioural psychology is severely in evidence in *animal* psychology, which is still dominated by the behaviourist viewpoint. Suggestions that an animal behaves in a certain way **because it is motivated by what it thinks, feels or intends** is studiously avoided in ‘serious’ scientific reports of studies of animal behaviour.⁵ Such suggestions are denigrated as ‘anthropomorphism’ — the unwarranted projection of attributes of human personality on to the non-human world. The consequence of this attitude is that studies of animal behaviour and animal societies are usually presented in the scientific literature as **meaningless descriptions of observed events** devoid of any attempt at empathic insight. (Paradoxically, the reverse of anthropomorphism, the ‘explanation’ of human behaviour in terms of animal instincts, has become increasingly prevalent.⁶) In this way, even the little insight into the *mental* life of non-human creatures that *is* available to us is artificially denied and **Descartes’ error of regarding animals as automata is perpetuated**. The avoidance of anthropomorphic thinking amounts to a denial of the full implications of Darwin’s revelation of the interrelatedness of animal species, including man. Our close relatedness, in evolutionary terms, to the higher animals implies that the obvious analogies between human behaviour and animal behaviour have their roots in psychological similarities.⁷

In attempting to understand the elements out of which mental phenomena are compounded, it is of the greatest importance to remember that from the protozoa to man there is nowhere a very wide gap either in structure or behaviour. From this fact **it is a highly probable inference that there is nowhere a very wide mental gap.**

— Bertrand Russell⁸

Scientific Dualism

Almost all neurophysiologists subscribe at present to the concept of psychoneural identity or psychophysical parallelism. They firmly believe consciousness to be nothing more than some kind of by-product of the firing of all those neurons. Sir John Eccles⁹ is among the few exceptions, who insist that consciousness is a primary irreducible aspect of reality that influences the firing pattern of neurons. Eccles even claims to be able to specify the particular area in the brain where the interaction between the biophysical substrate (the brain) and the 'spirit' or 'soul' (consciousness) takes place.

According to Eccles, this special area of the brain is the 'supplementary motor area' (SMA), located at the very top of the brain. The SMA was discovered in 1920 by Wilder Penfield.¹⁰ The discovery was neglected for a long time until Porter and Brinckman¹¹ surgically implanted micro-electrodes in the brain of a monkey. The monkey had to press a lever to obtain food. The micro-electrodes recorded a firing of neurons in the SMA about a tenth of a second before the monkey pressed the lever. This activity in the SMA preceded the firing in the motor cortex that initiates the muscular action. The implication seems to be that the monkey's *conscious decision* to press the lever was associated with the SMA.

Another interesting discovery is the 'readiness potential' of Kornhuber and his associates.¹² These investigators devised a method of measuring minute electrical potentials occurring in various parts of a human subject's scalp. They showed that, when carrying out a simple voluntary action such as flexing a finger, the human brain shows a gradual increase in negative electrical potential. This increase in potential as the brain prepares to make a voluntary muscular action is greatest in the region of the SMA.

Eccles adduces these and other experimental findings in support of his view of consciousness as an agency that acts on the brain. This kind of evidence for dualism is, of course, slight. A materialist could quite reasonably claim that these experiments show only that the SMA is a common meeting-point of pathways that lead to muscular action, not an *initiator* of action. The association of the *conscious intention* to make a muscular action with a particular small region of the brain is, nevertheless, intriguing.

A rival to the SMA as a possible 'seat of consciousness', or location in the brain where consciousness exerts its causal influence, is the 'reticular formation'. This small organ on the upper part of the brain stem, according to Moruzzi and Magoun, is responsible for the *general state of alertness* of the organism.¹³ It is, in evolutionary terms, a very old part of the brain. It is present in fishes and reptiles as well as in the

higher animals including man. Whenever the brain is awake it is active; otherwise it is not. It is localised close to the interface between the tertiary sensory cortex and the tertiary motor cortex — i.e. in the region of the brain where the most subtle and intricate cognitive processes would be expected to take place. Also in the same region is the ‘anterior cingulate sincus’, which Sir Francis Crick has recently suggested as the organ in which our impression of free-will is generated.¹⁴

Descartes suggested that the pineal gland was the ‘seat of the soul’.

Independently of whether one approaches the question from a dualist or a materialist standpoint, it is undoubtedly of fundamental importance to understand the relationship between consciousness and brain activity. But attempts to associate consciousness with some *specific* organ or locality in the brain are possibly misguided. The neurophysiological action associated with conscious mental activity involves many brain systems, each making its own contribution; a vast amount of parallel processing involving the whole brain seems to be involved in building up the subjective impression of the self and the external world.

Dualism and Physics

In 1953, Eccles proposed that the action of consciousness on the neural network might be related to the indeterminacy of physical laws allowed by quantum physics — that the randomness inherent in matter might be organised into correlated purposeful patterns of neural firings. This notion had been clearly expressed by Eddington, much earlier:

Deviations from chance occur, but they are regarded as manifestations of something outside physics, namely consciousness or (more debatably) life. There is in a human being some portion of the brain, perhaps a mere speck of brain matter, perhaps an extensive region, in which the physical effects of his volition begin, and from which they are propagated to the nerves and muscles that translate the volition into action. We will call this portion of matter ‘conscious matter’. It must be exactly like inorganic matter in its obedience to the fundamental laws of physics which, being of epistemological origin, are compulsory for all matter, but it cannot be identical in all respects with inorganic matter, for that would reduce the body to an automaton acting independently of consciousness. The difference must

necessarily lie in the undetermined part of behaviour; the part of the behaviour that is undetermined by the fundamental laws of physics must in conscious matter be governed by objective law or direction instead of being wholly a field of chance...

Accordingly the distinction between ordinary matter and conscious matter is that in ordinary matter there is no correlation in the undetermined parts of the behaviours of the particles, whereas in conscious matter correlations may occur. Such correlation is looked upon as an interference with the ordinary course of nature, due to the association of consciousness with matter; in other words, it is the physical aspect of volition.

— *Sir Arthur Eddington* ¹⁵

Eccles develops the argument a little further by speaking of certain neurons being in delicate states of unstable equilibrium — close to the threshold of firing so that they can be triggered by the (correlated) quantum fluctuations. However, as Rosenblueth has pointed out¹⁶, the threshold energy required to activate a neuron into firing is, in quantum terms, extremely large — many orders of magnitude greater than the energies of typical quantum fluctuations. Thus, the kind of delicate balance postulated by Eccles would seem rather far-fetched — neurons would seem, on this argument, to be essentially classical rather than quantum devices. The discovery of ‘microtubules’, minute electron-carrying channels within living cells, has recently cast some doubt on Rosenblueth’s argument. A neuron is not simply a switching device; it is a living organism containing a kind of ‘nervous system’ of its own, that may be tiny enough and delicate enough for quantum physics — and the correlated quantum fluctuations postulated by Eccles to account for volition — to play a significant role in the processes that determine whether a neuron will fire.¹⁷ The relevance of quantum effects in understanding consciousness and volition then begins to seem slightly more plausible. (But only slightly.)

Rosenblueth raised another objection: Eccles’ proposal requires that the mind, in producing a volitional act, would have to assess the states of millions of neurons and to select those it would have to activate to achieve the required effect.¹⁸ Put like that, Eccles’ idea does sound absurd. But ‘the mind’ does *in fact* ‘assess’ the activity of billions of neurons, when it extracts meaningful *subjective experience* of the world from the busy electrical activity of the brain.

This is no less absurd, and how it can be so is totally incomprehensible. But there it is!

Eccles' model has also been severely criticised on the grounds that correlations in elementary events cannot be accommodated within the indeterminacy allowed by quantum physics — the very idea of such correlations contradicts the probabilistic laws of quantum theory. According to Schrödinger, since quantum theory predicts the statistics of the behaviour of a large number of elementary unpredictable events, then

... if these statistics are interfered with by any agent, this agent violates the laws of quantum mechanics just as objectionably as if it interfered — in pre-quantum physics — with a strictly causal mechanical law... The net result is that quantum mechanics has nothing to do with the free-will problem.

— E. Schrödinger¹⁹

I am in principle in agreement with Schrödinger, except that I cannot see what is 'objectionable' about the idea that known physical principles need modification when a new physical principle, or extra-physical agency, is introduced. The arguments put forward by Eddington and Eccles are self-contradictory and self-defeating; they introduce a 'new' primary agency (consciousness) and then try to argue that its effects have to be contained within the bounds set by the physical laws that would have governed the system in its absence! The 'fundamental physical laws' are not 'of epistemological origin' and 'compulsory for all matter'. They are phenomenological laws deduced from observations and experiments on 'non-conscious' matter. The laws governing the relationship between consciousness and matter are still to be elucidated; if consciousness is indeed a primary causal agent it would be *expected* to transcend the laws that are currently regarded as the 'fundamental laws of physics'.

The hypothesis I wish to draw attention to and to consider is that consciousness is an aspect of some physical agency that has remained unrecognised by the physical sciences simply because the physical sciences have hitherto dealt only with the laws that govern the behaviour of matter *in its absence*.

Consciousness and Time

The common notion of 'the five senses' — sight, hearing, touch, taste and smell — is quite false, as a little reflection shows. It neglects quite obvious mechanisms of sensory perception, such as the sensation of

heat and cold, and the kinesthetic senses that provide awareness of bodily configuration and muscular action. And it leaves out of account a fundamental 'sense' — the apprehension of the passage of time.

The perceptual mechanisms that give rise to sensations of sight, hearing and touch, for example, do not act instantaneously. They involve enormous tasks of information processing and information selection, which the brain performs in a fraction of a second. The result is a fully-integrated and consistent conscious apprehension of external events; for example, when we speak we experience a perfect synchronisation between the sounds and the lip movements. The brain is performing a remarkable feat in producing this temporal consistency — the apparent simultaneity of the sensations coming from different sensory channels. The fact that there is a time delay between the reception of raw information by the brain and our conscious awareness of it is, therefore, hardly surprising. What *is* surprising is that there are neurophysiological experiments whose results seem to indicate that this time delay is paradoxically long, and thus to support the idea of consciousness as a passive bystander taking no part in what we imagine to be our volitional acts.

The experiments of Kornhuber *et al.*²⁰ demonstrated that when we make a spontaneous action such as flexing a finger at an arbitrary time that we are free to choose, an electrical potential, the 'readiness potential', begins to build up in the brain *a full second or even a second and a half before the finger flexes*. Yet the subjective impression is that the decision and the flexing are simultaneous. This seems to suggest that conscious awareness of the event arises far too late to have any effect on the decision process — on the mental event that feels subjectively to be an act of 'free will'.

An alternative explanation might be that the process, the initiation and formulation of the decision to flex a finger and the resulting muscular action, *is in fact a consciously controlled activity*, but that, unless we pay special attention to it, *we mislead ourselves into feeling that it is instantaneous*. If we observe our mental activity introspectively before we flex a finger at an arbitrary time of our own choosing, *it becomes clear that very subtle and elusive shifts of mental state are taking place* all the time we are waiting to perform the action. The idea that the subject in the Kornhuber experiments is not consciously aware *at all* of the mental activity that is responsible for the readiness potential would appear, therefore, *to be rather naive*. *Conscious awareness of the passage of time is not uniform with the passage of time on a clock*. As we have all experienced, subjective time seems to flow faster or slower according to our mental state. The

Kornhuber experiments may be simply a dramatic demonstration of this mismatch between ‘subjective’ and ‘objective’ time, rather than an indication of a real delay in becoming conscious of our mental activity.

Libet’s²¹ experiments revealed similar apparent delays in the conscious apprehension of external stimuli. Reflex responses to stimuli are produced by the brain in about a tenth of a second. They are automaton-like. However, the behaviour of humans and other animals has a flexibility and adaptability in its response to unexpected events that transcends the kind of behaviour that one would expect of pre-programmed automatic reflexes and conditioned reflexes. The commonsense view is that *conscious* mental activity *is* involved in producing the flow of appropriate decisions about *how* to respond to events. Libet’s experiments seem to deny this by indicating that conscious awareness of events arrives too late.

Tactile signals from the outside world enter the brain via the somatosensory cortex. Libet implanted electrodes in the somatosensory cortex of patients undergoing brain surgery. Electrical stimulation produced the subjective impression that a portion of the skin was being touched, though a qualitative difference enabled the subject to distinguish the effect of the stimulation from an actual touching of the skin. Libet found that his subjects became conscious of the electrical stimulation *half a second* after it began. If stimulation continued for less than a quarter of a second the subject remained unaware of it. If the skin was actually touched *during* electrical stimulation within a quarter of a second of its onset, the subject reported that the skin was touched *before* the electrical stimulation began. Thus, conscious perception of the artificial brain stimulation is considerably delayed, and the brain does not reveal it to consciousness at all unless it persists. The brain deals with a natural signal — actual touching of the skin — rather differently. (How does it know the difference?) The experiments just described are consistent with the possibility that conscious awareness of a natural signal is not appreciably delayed. However, if the skin is touched and then electrical stimulation begins — even as much as a quarter of a second later — the subject reports that the skin was *not* touched! Libet referred to this surprising effect as ‘backward masking’. The implication seems to be that there is a delay of about a *quarter of a second* before a stimulus to the skin is consciously perceived, and that during that time electrical stimulation can prevent the event from reaching consciousness.

This is quite strange. If we extrapolate this kind of delay to other modes of sensory perception — as we must once we accept its validity for the tactile mode, since simultaneous sounds, sights and

tactile sensations are apprehended consciously as simultaneous — the implication seems to be that our actions are formulated almost entirely subconsciously. If conscious awareness is delayed to this extent it would seem that consciousness is all the time observing a replay of events that have already taken place a quarter of a second ago! Conscious control of our actions, at least in fast-moving situations such as playing tennis or even carrying on a conversation, would then be an illusion.

There is a possible alternative interpretation of the ‘backward masking’ effect in Libet’s experiments. Conscious apprehension of the flow of events is a phenomenon intimately involving short-term memory. That electrical stimulation of the brain can eliminate short-term memory is a well-known fact. In the phenomenon of backward masking, the subject may become aware of skin-touching relatively rapidly, but then the subsequent electrical stimulation, beginning up to a quarter of a second later, may be eliminating the *memory* of it. That is, the electrical stimulation of the somatosensory cortex may be inducing a highly specific amnesia, wiping out the memory of the fact that the skin had been touched.

These neurophysiological experiments are intriguing, but their implications remain puzzling and ambiguous. The nature of consciousness and its role in life are enigmas. So is the question of the consciousness of time, and the relationship between consciousness and time.

The Split Brain

Around 1950, Roger Sperry and Ronald Myers²² made an interesting discovery. It is well-known that the brain of the higher animals, including man, is a double organ consisting of a right and left hemisphere communicating with each other via a bridge of nerve tissue, the corpus callosum. Myers and Sperry found that when the two halves of the cerebrum are disconnected by severing the corpus callosum, each becomes an autonomous unit that behaves like a complete brain. In their experiment with a cat, they divided the optic chiasm as well as the corpus callosum, so that visual information from the right eye was received only by the right brain and information from the left eye was received only by the left brain. If the animal was working with only one eye, it could behave normally and learn a task as well as a normal cat. If the eye was then covered and the same task presented to the other eye, there was no sign of recognition and the animal had to learn all over again — this time with the other half of its brain.

Studies of split-brain phenomena were extended to human subjects who underwent brain-splitting surgery — severing of the corpus callosum — for medical reasons (surgeons resorted to this drastic operation, with a remarkable degree of success, **to control severe cases of epilepsy**). The first operation of this kind was performed in 1961. Since then, Sperry and Gazzaniga²³ have investigated a number of such cases.

Gazzaniga reports that the operation produces no noticeable change in the patient's temperament, personality or general intelligence. The first of these patients could not speak after the operation; **his speech faculty recovered after thirty days**. He tended to use the right side of his body (controlled by the left hemisphere of the brain) more than his left side (controlled by the right hemisphere). When an object was placed on his left hand he usually denied its presence. In a typical experiment the subject is asked to fix his gaze on a central point of a board. Spots of light are then flashed in sequence across the board. Split-brain subjects describe what they see on the right hand half of the board but deny having seen any lights on the left half. Now, since the right side of the visual field is projected to the left hemisphere and the left side of the visual field to the right hemisphere, **a naive conclusion would be that the right hemisphere in split-brain subjects is blind**. However, if the subject is required to respond to the lights by a *non-verbal* response, such as a hand-signal, **visual perception by the right hemisphere is found to be no less effective than visual perception by the left hemisphere**.

The conclusion is that both halves of the split brain are equally aware of the environment and capable of responding to it in an intelligent manner, but that **only one of the halves (the left) can express itself in speech**. In fact, the location of the 'speech centres' in the human brain have been identified; human language is processed by two areas of the cerebral cortex, Wernicke's area and Broca's area. Both of them are, **in almost all cases, in the left hemisphere**. In one particular split-brain subject investigated by Donald Wilson in 1977, **both hemispheres were able to understand speech after the operation**, although **only the left hemisphere was able to speak**. Some time later, **the right hemisphere learned to speak**, and then distinct personality differences in the two halves of this subject became apparent. For example, the left hemisphere expressed a desire to become a **draughtsman**, while the right hemisphere preferred to become a racing driver!²⁴

The surgery has left these people with two separate minds, that is, two separate spheres of consciousness. What is experienced in the right hemisphere seems to be entirely outside the realm of awareness of the left hemisphere (and vice versa). The mental division has been demonstrated in regard to perception, cognition, volition, learning and memory. One of the hemispheres, the left, dominant or major hemisphere, has speech and is normally talkative and conversant. The other, the minor hemisphere, however, is mute and dumb, being able to express itself only through non-verbal reactions.

— Roger Sperry²⁵

The designation of the left hemisphere — the one with the speech centres — as ‘dominant’ seems to me unfortunate, and has led to a great deal of unwarranted speculation. It perpetuates Descartes’ error in presupposing the faculty of speech to be the *sine qua non* of human cognition and consciousness. Currently fashionable speculations about the role of the ‘non-dominant’ right hemisphere range all the way from the notion that the right brain is an unconscious automaton, to the notion that it has exclusive claim to the synthetic, holistic cognitive faculties of imagination, intuition and creative thought. Both these notions seem to me to be naive and simplistic; the evidence seems, rather, to support the view that the two hemispheres are equal partners in a collaborative effort, with the left brain contributing rather more to what may be termed the analytic cognitive skills and the right brain contributing more to the synthetic cognitive skills. Which hemisphere ‘dominates’ will then depend entirely on the particular activity the human organism happens to be engaged in.

Incidentally, about five percent of the human population is left-handed, whereas the location of the speech centres in the left hemisphere is almost universal. In left-handed people, therefore, the side of the body that dominates in tasks requiring precision of muscular control is the one controlled by the non-verbal, so-called ‘non-dominant’ right hemisphere.²⁶

Multiple Consciousness

Some of the *voluntary* muscular actions of one hemisphere of a split-brain subject presumably seem, to the consciousness of the other hemisphere, like *involuntary* actions. One subject, for example, told an investigator (i.e. her left hemisphere told the investigator) that once, while putting on a garment, her *left hand* was trying to take it off.²⁷ Presumably the two hemispheres had different opinions about its

suitability! People who have undergone split-brain surgery learn to adapt to these anomalies — the two separate brains learn to co-operate, employing body language cues to exchange some information that would normally be transferred across the corpus callosum.

‘Motor automatism’ is the name given to bodily movements produced by the subconscious mind, that the conscious mind cannot account for. They occur in hysterics and somnambulists, and are quite easy to produce by suggestion in a hypnotised subject. Incidentally, the very odd and distinctive subjective difference between such automatisms and ‘voluntary’ muscular actions gives very substantial support for the reality of free will, in the free-will versus determinism debate — if ‘free will’ really were illusory and consciousness were taking no part in producing ‘normal’ muscular action, it is difficult to see why there should be any difference in the subjective ‘feel’ of these two kinds of action. The utterances of a medium in a trance state are, presumably, motor automatisms initiated by the subconscious mind of the medium. ‘Automatic writing’²⁸ produced in trance states is a similar phenomenon, which can be elicited from normal subjects by hypnosis. For example, hypnotised subjects may give quite different responses to what they feel or hear, according to whether they respond by speaking or by writing. A hypnotised subject, told that he will not feel pain, when subjected to a painful stimulus may *say* that he feels no pain and *show no sign of feeling pain*, while his hand complains *in writing* that he is being hurt.²⁹ Post-hypnotic suggestion can produce not only sudden impulses to act in a peculiar way when the appropriate cue arises — which the subject will often try to rationalise by improvising *ad hoc* pretexts for his eccentric behaviour — but also visual or auditory hallucinations.³⁰

On one occasion I have experienced a peculiar mental phenomenon which will presumably be familiar to many readers. In a state of annoyance I told off a friend quite rudely when I had no *conscious* intention of doing so — I was surprised to hear words issuing fluently from my mouth as if I were listening to someone else speaking. The effect was quite uncanny. It can be argued that the strongest evidence that ‘free will’ or ‘intentionality’ is no illusion can be adduced, paradoxically, from just those actions in which it is ‘conspicuous by its absence’

Though the behaviour of the left hand of the woman with the split brain had, for her left hemisphere’s awareness, the characteristics of involuntary motor automatism, there is no reason to doubt that it was, in fact, a *conscious, voluntary* action. In conjunction with the cases of ‘automatisms’ I have mentioned, this raises some important

and intriguing questions about the nature of consciousness. To what extent is consciousness present in what we call 'unconscious' mental activity? Is it not possible that the subjective impression of the *unity* of consciousness is an artifact, built up by separate conscious agencies at various levels of the mind, which in the normal mind in normal states communicate with each other in a harmoniously integrated way? In other words, I am suggesting that the 'ego' consciousness that each of us refers to as 'I' is supported by autonomous components of the psyche that themselves have some degree of conscious awareness. The proven high level of creative cognitive activity that the so-called 'unconscious' mind is capable of is further evidence for such a supposition. Jung discusses the presence of ideas and volitions in the unconscious, that imply something akin to consciousness, which he calls 'quasi-consciousness', associated with psychic regions outside ego-consciousness. A chapter of his work *On the Nature of the Psyche* is entitled 'The Unconscious as a Multiple Consciousness'.³¹

... something very like... consciousness does attach to unconscious contents, so that the possibility of an unconscious subject becomes a serious question. Such a subject, however, is not identical with the ego.

— C.G. Jung³²

The recognition that something 'akin to consciousness' is present in the psyche beyond the boundaries of our awareness (i.e. of our 'ego--consciousness' or 'primary consciousness') appears to have been first clearly enunciated by Frederick Myers. William James wrote in praise of Myers' hypothesis of 'subliminal consciousness':

I cannot but think that the most important step forward that has occurred in psychology since I have been a student of that science is the discovery, first made in 1886, that, in certain subjects at least, there is not only the consciousness of the ordinary field, with its usual centre and margin, but an addition thereto in the shape of a set of memories, thoughts and feelings which are extramarginal and outside the primary consciousness altogether, but yet must be classed as conscious facts of some sort, able to reveal their presence by unmistakable signs. I call this the most important step forward because, unlike the other advances that psychology has made, this discovery has revealed to us an entirely unsuspected peculiarity in the constitution of human nature.

— Wm. James³³

These considerations suggest that the usual notion that identifies consciousness with ego-consciousness gives an oversimplified and misleading view of the structure of the human mind and the role of consciousness in psychic processes. If we accept that the presence of consciousness is indicated by apparent *awareness of the contextual meaning of situations* and the *capacity to implement appropriate volitional responses* (i.e. a kind of Turing test), then the conclusion seems inescapable that consciousness is a feature of much of so-called ‘unconscious’ mental activity. The term ‘unconscious mind’ is, then, an unfortunate and misleading misnomer. So is the term ‘automatism’ applied to the manifestations of volitional action initiated from regions of the psyche beyond the boundaries of ego consciousness — it suggests that all mental activity of which the so-called ‘conscious mind’ is unaware is unreflecting robot-like activity of the reflex action kind.

The idea of a properly functioning human personality as a community — of which the ego is a member — of autonomous entities with varying degrees of consciousness, that acquires its coherence and unity from the harmony of their collective action, is supported by the study of pathological conditions of ‘dissociation’. In schizophrenia, hysteria and other psychotic conditions the harmonious coordination of psychic functioning breaks down.³⁴ The integrity of the ego or ‘conscious mind’ is then threatened by anomalous thoughts, moods and impulses that erupt into it from ‘unconscious’ sources. In the much rarer phenomenon of *multiple personality*, two or more ‘egos’ with distinct personalities appear to be present, alternating in their dominance and sometimes manifesting their presence simultaneously.³⁵

‘Fugue states’ are periods of amnesia precipitated by a traumatic experience or by intolerable stress. During the fugue, a secondary personality takes over. The primary personality re-emerges later, confused and agitated, with no recollection of the intervening events. In brief fugues the secondary personality may simply wander aimlessly and behave irrationally. In more spectacular cases of ‘dual personality’ the secondary personality behaves normally and may even be better able to cope with life than the temporarily submerged primary personality. A classic case is that of the Reverend Ansel Bourne, a Baptist minister of Rhode Island who, in January 1887, withdrew five hundred dollars from his bank and disappeared. He turned up again two months later, suffering from amnesia. He had found himself in Norristown, Pennsylvania, baffled as to why he was there, since he had

no recollection of the events of the previous two months. **This remarkable case of amnesia was investigated by William James.** When Bourne was hypnotised by James, a secondary personality emerged and recounted how he had travelled to Norristown, rented a shop under the assumed name 'A.J. Brown' and run it successfully, living a peaceful life away from the stresses and frustrations of the life of the Reverend Bourne.³⁶

A quite well-known and more complex case is that of **Christine Beauchamp, a student nurse in Boston,** who came to Dr. **Morton Prince** because she suffered from debilitating psychological problems. Under hypnosis, a different personality emerged — this personality, 'Sally', was lively, mischievous and childlike, quite unlike the listless and depressed Christine. Sally knew all about Christine, whereas Christine knew nothing of the existence of Sally. Sally would sometimes take control, playing childish practical jokes on Christine. Christine would sometimes 'wake up' from fugues during which Sally had taken a long walk and then vanished leaving the bewildered Christine to walk home. Eventually, a third personality emerged — an adult, responsible, self-controlled girl whom Prince refers to as 'B-4'. Sally and B-4 disliked each other intensely. B-4 thought that Dr. Prince was a man called William Jones. It turned out that this William Jones had once, in a drunken state, climbed a ladder to Christine's window — it seems highly probable that the shock of seeing Jones' face peering in at her was the traumatic event that had precipitated Christine's psychological troubles. Eventually, Prince decided (rather oddly and perhaps unwisely) that Christine and B-4 were the 'true selves' and attempted, by hypnotic techniques, to 'exorcise' Sally and to integrate Christine and B-4. During this process Sally cried out, "I won't be dead, I won't be dead; I have as much right to live as she has." Prince's treatment appears to have been successful, in that Christine, integrated with B-4, became a more well-balanced individual than the girl who had first come to him for help. Over the years, Sally made occasional reappearances, playing her typical practical jokes.³⁷

There are dozens of equally bizarre cases of multiple personality in the annals of psychology and psychiatry. Sometimes as many as five or six separate persons occupy the same psyche, forming a hierarchy, with the 'higher' personalities (who tend to emerge later) being aware of the 'lower' personalities, but not vice versa. Doris Fischer (b.1889)³⁸ first split into two 'individuals' at the age of three when her drunken father threw her to the floor. Eventually, *five* distinct persons emerged, taking over control by turns. The mind of Doris Fischer became a psychic battleground. The Reverend Walter Franklin

Prince, a psychologist, a close friend, and a source of much-needed psychiatric help, wrote about her in detail. She³⁹ died in a mental home in 1934, shattered by Prince's death.

The phenomenon of multiple personality indicates, more clearly than is apparent in the 'normal' human psyche, the structural intricacy of human personality, and the remarkable *organising* and *unifying* processes involved in maintaining the balance and integrity of mental functioning.⁴⁰

Cognition

The inevitable recognition of the inadequacies of behavioural psychology was succeeded by new approaches to experimental psychology and a willingness on the part of experimental psychologists to probe beneath the surface of the simplistic 'input-output' model of human and animal behaviour. 'Cognitive' psychology recognises the possibility, and the need, to investigate the mental processes that transform input into output, and deals with the aspects of learning, motivation and volition that behavioural psychology had deliberately ignored. Psychology became once more interested in the processes in human and animal subjects that underlie observed behaviour. A pioneer of the 'cognitive' approach to psychology was E.C. Tolman.⁴¹ He replaced the central concept of behavioural psychology, that regarded complex behaviour simply as the cumulative result of mechanical 'stimulus-response' pathways, by the notion of 'cognitive maps'. The behaviour of organisms such as mice and men is the result of internally-elaborated mental models of the environment:

[The brain] is more like a map control room than it is like an old-fashioned telephone exchange. The stimuli, which are allowed in, are not connected by just simple one-to-one switches to outgoing responses. Rather, the incoming impulses are usually worked over and elaborated in the central control room into a tentative, cognitive-like map of the environment. And it is this tentative map, indicating routes and paths and environmental relationships, which finally determines what responses, if any, the animal will finally release.

— E.C. Tolman ⁴²

Tolman's anti-behaviourist views were supported by his study of the behaviour of rats learning to find their way through mazes. The learning rat does not go through automaton-like sequences of bodily

movements. It acquires *knowledge* of the maze, rather than a set of conditioned reflexes or motor habits.

With the decline of behavioural psychology, psychological experimenters with human subjects began to accept the validity and importance of the 'subjective' information to be gained by simply asking subjects to report on their thought processes: their perceptions, their expectations, their way of dealing with the learning situations presented to them. Psychology once again began to attempt to understand *how people think* and was no longer satisfied with describing how they behave. The words 'cognition' and 'cognitive' have become increasingly prevalent in the psychological literature.⁴³

What exactly is 'cognition', and how is it related to consciousness? Unfortunately, the words 'cognition' and 'cognitive' seem to lack precise definition. They have gained wide currency and are used in various contexts by psychologists and educationists. They seem to be in danger of becoming merely fashionable jargon words altogether devoid of meaning.

'Cognition' becomes a somewhat less vague concept if one can make a real distinction between those brain processes that take place *automatically* (such as the information-processing involved in perception) and those that do not. The arguments I have presented suggest that such a distinction makes sense and fits many of the facts that otherwise remain extremely baffling, and that any theory of mental functioning must take account of. The very existence of consciousness is, in itself, quite strong evidence for the distinction.

Recall Searle's distinction between information-processing and *understanding the meaning* of perceptual input. Apprehension of meaning is clearly a function of consciousness. Recall, also, Rosenblueth's suggestion that consciousness confers evolutionary advantage on organisms that possess it, by enabling them to form 'internal representations' (i.e., 'cognitive maps'!). Mere information is transformed into knowledge; meanings, concepts and imagery are manipulated in a search for understanding and interpretation. If 'cognition' is defined to be this *non-computational* aspect of brain activity, then the conclusion appears inescapable that consciousness takes active part in cognition.

The hypothesis I wish to explore in subsequent chapters is that consciousness, in its widest sense, is the agency responsible for cognitive processes. It is what makes cognition, and the associated non-automatic behaviour, possible.

The *Journal of Consciousness Studies* was begun in 1994 to provide a forum for the growing interest in the mystery of

consciousness. Contributions to the discussion come from a wide spectrum of investigators: neurophysiologists, artificial-intelligence researchers, physicists, psychologists and philosophers. Correspondingly, an enormous range of styles of thinking, opinions, and suggested approaches to the 'hard problem' of understanding consciousness has emerged. Opinions range from the uncompromising 'consciousness is computation' stance of Daniel Dennett⁴⁴ to the pronouncements of the 'Mysterions' who claim that consciousness, by its nature, is destined to lie forever outside the scope of human comprehension.

My own feeling is that the debate circles too narrowly around the question of the relationship between the human or animal *brain* and the consciousness of the human or animal 'mind'. The scope of enquiry is widened if one looks at the more general phenomena of life and the way life has evolved, and asks whether there might be analogues and *precursors* of consciousness associated with living systems other than brains. We shall look into this possible approach in the next chapter.

At what stage in evolution does life become 'cognitive' in the broadest sense? Does awareness and the associated psychic dimension of reality suddenly come into being with the 'fortuitous', and relatively recent, arrival on the scene of animals with central nervous systems? From the earliest beginnings of life on earth the evolution of form and behaviour has been a process without abrupt transitions. It seems likely, therefore, that psychic evolution has also been a steady progression. Some degree of cognitive behaviour, as opposed to purely automaton-like responses, might be a feature of life in general, extending down, in varying degrees, to the cellular level. It is at least *conceivable* that there is something akin to 'psyche' even in the most primitive life-forms. Even an amoeba might, however dimly, be 'aware' of those aspects of its environment that its rudimentary sensory equipment conveys.

The scope of the current 'consciousness debate' may be too narrowly focused in another sense. A crucial component of the debate is the nature of subjective experience — consciousness and the associated cognitive processes are, after all, what subjective experience is 'made of'. Yet the whole range of types of subjective experience is scarcely taken into account. There is considerable evidence that subjective experience does not necessarily, and not always, exclusively arise from sensory perception or memory. In the first issue of the *Journal* the parapsychologist John Beloff expressed the view⁴⁵ that a proper understanding of consciousness would have to take into account anomalous, so-called 'paranormal' experience. In subsequent chapters

we shall be taking a look at some of the evidence that Beloff is alluding to.

Notes and References

1. Globus et al. 1976; Gregory, R.L., Consciousness, in Duncan & Weston-Smith 1977; Josephson & Ramachandran 1980; Hilgard, R.E., Consciousness in contemporary psychology, *Ann. Rev. Psychol.* 31, 1980, 1.
2. Suzuki 1949.
3. Hadamard 1945.
4. Eiseley, L., *The Unexpected Universe*, Gollancz 1970; Penguin 1973, p.13.
5. For interesting reflections on this state of affairs, see Crocker, D.R., Anthropomorphism; bad practice, honest prejudice? *New Scientist* 31, 1981, 159.
6. For example Desmond Morris, *The Naked Ape*, Cape, London 1967; Robert Ardrey, *The Territorial Imperative*, Collins 1967; Mary & John Gribbin, *Being Human: Putting People in Evolutionary Perspective*, Dent 1993.
7. Thorpe, W.H., Ethology and Consciousness, in Eccles (ed) 1966; Dawkins, Marion S., *Through our Eyes Only; The Search for Animal Consciousness*, Freeman, New York 1994; Smuts, Barbara, Encounters with animal minds, *Journal of Consciousness Studies* 8 (nos 5-7), 2001, p. 293.
8. Russell 1921, p.41.
9. Eccles 1953; 1966; 1977; Popper & Eccles 1977; Eccles & Robinson 1984.
10. Penfield 1953.
11. Eccles & Robinson 1984.
12. Deeke, L., Grötzinger, B. & Kornhuber, H.H., Voluntary finger movements in man: cerebral potentials and theory, *Biol. Cybernetics* 23, 1976, p.99; Eccles & Robinson 1984; Penrose 1989, 1990, p.568.
13. Moruzzi, G. & Magoun, H.W., Brainstem reticular formation and activation of the EEG, *Encephalography and Clinical Neurophysiology* 1, 1949, p.455; Penrose 1989, p.491.
14. Crick 1994; Voss, D., Soul searching with Francis Crick, *Omni*, Feb. 1994, p.46.
15. Eddington 1939, p.180.
16. Rosenblueth 1970, p.86.
17. Penrose 1994; Hameroff, S.R. & Penrose, R., Orchestrated reduction of quantum coherence in brain microtubules, in Hameroff *et al.* (eds) 1996.
18. Rosenblueth 1970, p.87.
19. Schrödinger 1951, p.61, p.67: quoted by Rosenblueth 1970, p.87.
20. loc. cit. (ref.11).
21. Libet, B. et al., Subjective referral of the timing for a conscious sensory experience, *Brain* 102, 1979, 193; Penrose 1989; Cytowik 1994.

22. Myers, R.E. & Sperry, R.W., Interocular transfer of visual form discrimination in cats after section of the optic chiasm and corpus callosum, *Anatomical Record* 174, 1953, p.351.
23. Sperry, R.W., Brain bisection and consciousness, in Eccles (ed.) 1966, p.299; Gazzaniga 1970; Gazzaniga, M.S., Le Doux, J.E. & Wilson, D.H., Language, praxis and the right hemisphere: clues to some mechanisms of consciousness, *Neurology* 27, 1977, p.1144.
24. Penrose 1990, p.498.
25. Sperry, R.W., Some general aspects of interhemispheric integration: in Mountcastle (ed.) 1970.
26. Interesting speculations on a genetic link between handedness and styles of linguistic thinking were presented by the psycholinguist Thomas Bever at the 1990 annual meeting of the American Association for the Advancement of Science; Brownlee, S., Language of the left, *U.S. News and World Report*, 4 Feb. 1992.
27. A television documentary. I remember neither the name of the programme, nor the date on which I saw it.
28. Inglis 1985b; Guiley 1991.
29. Inglis 1985b.
30. James 1902; 1961 edn, p.193.
31. Jung 1985b, p.100.
32. *ibid.*, p.75. The whole of this work is an elaboration of and a justification for the statement I have quoted.
33. James 1902; 1961 edn, p.191. James is commenting on Myers, F.W.H., *Proc.Soc.Psychical Res.* 7, 1892, p.298; Myers refers to actions produced by 'subconscious' psychic processes, which he calls 'automatisms'. The passage from William James is quoted by Jung (1985b, p.77). See also James, Wm., Frederick Meyers' service to psychology, *Proc. S. P. R.* 17, 1901, 13.
34. Some interesting cases were discussed by Jung in his inaugural dissertation at the University of Zurich in 1902, 'On the psychology and pathology of so-called occult phenomena': reprinted in vol.1 of Jung 1968, and in Jung 1982a. A fascinating account of a case of multiple personality is *The Three Faces of Eve*: Thigpen & Checkley 1957.
35. See, for example, the chapter 'How many me's are there?' in Wilson 1978; Rosenfield 1992, chapter 5; Cytowic 1992.
36. James 1890, p.391; Jung 1982a; Wilson 1988, p.316.
37. Prince 1906; Dingwall 1968; Wilson 1978; Gordon 1992.
38. Prince 1963; Wilson 1978; Wilson 1988; Gordon 1992.
39. they?
40. Hilgard 1977; Cytowic 1992; etc.
41. Tolman 1932.
42. Tolman, E.C., Cognitive maps in rats and men, *Psychol. Rev.* 55, 1948, 189.

43. Neisser 1967; Hilgard, E.R., Consciousness in contemporary psychology, *Ann. Rev. Psychol.* 31, 1980, 1.
44. Dennett 1991; Dennett, D.C., The Unimagined preposterousness of zombies, *J. Consc. Studies* 2, 1995, 332; Facing backwards on the problem of consciousness, *J. Consc. Studies* 3, 1996, 5.
45. Beloff, J., Minds and machines: A radical dualist perspective, *J. Consc. Studies* 1, 1994, 32. A special issue of the *Journal of Consciousness Studies*, devoted to parapsychology, is to appear in 1998.

9 COMPLEXITY AND ORGANISATION

Vitalism

Various scientists are pondering the prospect that a basic physical law lies waiting to be discovered, a law defining the circumstances under which systems infused with energy become more complexly structured. This law would carve out local exceptions to the general tendency of things to become chaotic and bland — higher in entropy — as dictated by the famously depressing second law of thermodynamics.

— R. Wright ¹

In previous chapters I have been suggesting that the physics of inanimate matter may be inadequate to account fully for the workings of brains and minds. For awareness of the meaning of the information supplied by the senses to take place, the organism must respond to holistic knowledge of what the perceptual information signifies. I have argued that this process of conscious apprehension is unlikely to be purely computational. The continual transformation and re-organisation of knowledge constitutes the ‘cognitive’ activity of the psyche. I suggest that being aware is *essential* to the operation of this cognitive activity, not just an irrelevant epiphenomenon. On this view, consciousness is a manipulator and organiser of reality. Its action serves the purpose of organising and maintaining a coherent psychic structure — a structure the reality of which consists of subjective experience and knowledge. The brain activity that *is* purely computational constitutes an interface between the ‘external’ world and the subjective experience of the psyche.

As we have seen, the idea that consciousness ‘acts on’ the brain has been advocated by Popper and Eccles, and earlier by Eddington and others. The idea has its roots in Cartesian dualism. One of the reasons for its rejection by most scientists is, perhaps, its narrow specificity — brains are, after all, a relatively recent evolutionary development; it appears highly implausible that brain tissue or ‘perhaps a mere speck of brain matter’ could be radically different from all other matter in the universe, could be uniquely, magically, endowed with the

capacity to respond to different physical laws from the ‘mechanistic’ laws that are asserted to govern everything else.

The idea becomes more plausible if one surveys the phenomenon of *living* matter in general. Neo-Darwinism notwithstanding, something akin to ‘cognition’ *is* recognisable throughout the phenomenon of life. Evolution and morphogenesis can be interpreted as purposive, knowledge-based organising activity very like the organising activity of the psyche that our hypothesis attributes to consciousness. The postulated matter-consciousness interaction then appears to be a universal principle; its manifestation in brain function only an instance of it. Perhaps the time has come for a serious reconsideration, in the light of current scientific knowledge, of long-discarded ‘vitalistic’ ideas that postulated the existence of an *anima mundi*, a creative organising influence that transcends mechanistic physical and chemical laws. Perhaps the views of Anaxagoras, who spoke of ‘Mind’ as a universal organising principle bringing order out of chaos, are closer to the way the world *really* works, than the reductionist, mechanistic philosophies that are currently in vogue.

In earlier times the fundamental questions of science were concerned with identifying the basic constituents of matter and elucidating the elementary mechanical laws of their interaction. This preoccupation gave rise to reductionism, the belief that these basic constituents and the principles governing their motion and interactions in space and time were the ultimate basis of reality, and that everything in the world was potentially understandable on that basis — full understanding would finally emerge from theoretical application of the elementary laws in more and more complicated situations. As we have seen, progress in science has tended to give increasing support to this belief, so that in many scientific minds it took on the appearance of established fact. Gradually, ideas that contradicted the belief fell into disrepute: theological implications of seemingly intelligent design and purpose in the natural world, Cartesian dualism, ‘teleological’ ways of thinking about evolution, non-material formative agencies in morphogenesis, and so on. They fell into disrepute because, from the reductionist standpoint, they seemed vague and *insubstantial*. With the ever-increasing success of the reductionist approach they became increasingly irrelevant — understanding of phenomena, it seemed, could be gained more effectively without them. Anti-reductionist ideas finally came to be regarded as *anti-scientific*.

The phenomenology of highly-complex systems is now receiving more attention. The meaning of ‘complexity’ seems intuitively obvious, but it turns out to be a rather elusive concept when

one attempts to pin it down in a rigorous definition.² Throughout the twentieth century areas of investigation concerned with the genesis of intricately organised phenomena have opened up. Satisfactory understanding of biological systems requires the development of new ways of thinking and new theoretical structures. Complex systems call for holistic explanatory principles quite different in kind from the physical and chemical principles of their material constituents. Knowledge of the interaction of constituents — biochemical molecules — is contributory and supportive, but the myopic reductionist assertion that molecular constitution fully ‘accounts for’ biological complexity leaves the desire to understand unfulfilled. Moreover, the assertion may not be valid.

All the questions that science asks are the multiple facets of a single, tantalising question: Why and how does the universe behave the way it does? Important components of the question are: Why does order arise out of disorder? In the living world we observe that complexity tends to beget greater complexity; why? These are the central mysteries that future scientific investigation will be attempting to penetrate. Reductionist science has made brave attempts to provide answers, attempts that have culminated in the stunningly simple ‘explanation’ offered by neo-Darwinism, that invokes only ‘mechanism’ and ‘chance’.

As the ‘laws’ underlying the genesis of complex organisation become better understood and appropriate theoretical structures evolve for investigating and expressing them, the question will arise as to whether these laws are an inevitable consequence of chemical mechanisms, and thus an epiphenomenon, or whether the reality we observe is actually a manifestation of chemical mechanisms *together with autonomous organising principles that are equally fundamental, and irreducible*.

... from what we have learnt about the structure of living matter, we must be prepared to find it working in a manner that cannot be reduced to the ordinary laws of physics.

— Erwin Schrödinger³

Underlying all the questions that science asks is the awesome metaphysical question, which in all probability is unanswerable in terms intelligible to the human mind: why does any universe exist at all? The question of how, in the universe that does exist, life and mind have arisen, is secondary, and may be answerable in scientific terms. The answer may be a ‘mechanistic’ explanation, or it may involve

something more. In either case, the answer would not tell us *why the actually-existing universe happens to be of the rather unlikely kind in which life and mind are possible*. Indeed, the fundamental physical laws appear to be ‘finely tuned’ so that it *is* possible; a slightly different physics would have produced a universe in which life and mind *could not* arise. *This strange circumstance is known as the ‘anthropic principle’*. Of course, one can argue that, since minds do *in fact* exist, the universe they find themselves in must *of course* be of that special kind! But what, then, of the infinity of possible universes whose constitution precludes the evolution of life and mind. Do they *also* ‘exist’? Is it just that, among an infinitude of different universes, some of them inevitably just happen to produce minds, and this is one of them? If that is *not* so — if this universe that our minds observe, uniquely among all possible universes, is the only one that ‘exists’, *then the fact that the possibility of life and mind lay dormant in its elementary physical constitution from the beginning is exceedingly strange*. This basic strangeness of existence is made more, not less, incomprehensible by attributing life and mind to the work of blind chance.

Psychic Evolution

Evolutionary theory is concerned, by and large, with the evolution of the form of living organisms; its foundations lie in the way morphological characteristics are passed on from generation to generation by genetic inheritance. In the evolution of *behavioural* characteristics in the higher animals other factors enter that are not in any direct sense genetic. *Alongside physical evolution there is a psychical evolution of a species — the development of its cognitive potentialities*. It is interesting to note that the increase in brain complexity in humans and the corresponding increase in psychological complexity *has been, in evolutionary terms, extremely rapid*. It far exceeds the kind of development that can be comfortably accommodated by purely mechanistic modes of explanation — in terms of environmental adaptation and consequent survival the complexity of the human brain was simply unnecessary. The richness of human culture, including the highest achievements in the arts and sciences — *the whole astonishing phenomenon of the world of human activity — stems from the creative cognitive activity of the human psyche*. Surely, something more is afoot here than a series of mishaps in the genetic message that encodes the morphology of the mammalian brain.

In the higher animals the *capacity to learn* is inborn and genetically inherited, as are certain instinctive behaviour patterns. Each individual learns anew to adapt to the behaviour of its community, thus acquiring behaviour patterns that are culturally, not genetically, determined. This aspect of evolution is most noticeable in *Homo sapiens*. The efficacy and intricacy of communication that this species enjoys is a revolutionary development in the evolutionary process; David Attenborough has characterised the human species as ‘the compulsive communicators’.⁴ Education is the dominant mechanism by which cognitive skills are passed on from generation to generation, not genetic inheritance. Ideas, in the form of items of knowledge, opinions, scientific hypotheses, rumours, fashions, superstitions, traditions and cultural conventions are communicated from mind to mind, and in their psychic environment they interact, propagate and evolve in much the same way that physical organisms do; ideas are subject to ‘natural selection’ whereby only those survive that are adapted to the psychic needs of the human community. Dawkins⁵ drew attention to this remarkable analogy and gave the name ‘memes’ to the basic units of information that organise psychic structures in a manner similar to the way genes organise physical structures. It must be emphasised that Dawkins is not advocating any kind of dualism here — he would no doubt be horrified by any such misinterpretation! His point is that human communication raises the evolutionary process to a higher level of complexity where emergent epiphenomena demand to be understood on their own terms, and that the phenomenology of ‘memetic’ evolution operates on principles that are similar in many ways to those of genetic evolution.

Entelechy

Hans Driesch was one of the pioneers of experimental embryology. In 1891 he separated the two conjoined cells that, under normal circumstances, would have developed into the two halves of a sea-urchin. Surprisingly, two normal sea-urchin embryos of smaller size than usual developed.⁶ In the following year he obtained whole embryos after separation at the four-cell stage, after combining two eggs into one, and after cutting a single egg in two. This was the beginning of the discovery of the astonishing capacity of organisms to respond to drastic interference by reorganising themselves: the phenomenon of regeneration.

Regeneration processes are in many cases quite spectacular. If a newt or a salamander loses a limb it can grow a replacement. Lobsters

can, similarly, replace lost claws. In these and similar cases highly specialised cells somehow recover their embryonic state as a result of the injury. They must also have some way of sensing their *precise position in the whole organism* in a way that remains inexplicable on the basis of present knowledge of cell biochemistry and morphological development. It is as though a plan of the organism exists and the cells of the injured organism have access to it.⁷ If an arm of a starfish is broken off, not only will the starfish regenerate a new arm, but the severed arm will regenerate a new starfish!

Driesch believed that he saw evidence, in the purpose-oriented metamorphoses of living matter that take place in a developing embryo, for the influence of a non-material organising agency. Following Aristotle, he adopted the word 'entelechy' to refer to this agency.

Various terms have been adopted in referring to a supposed non-material influence, transcending known physical laws and responsible for organising the structural complexities of living matter. Szent-Györgyi coined the word 'syntropy' and regarded it as analogous to the psychological activity that expresses itself in a 'drive towards synthesis, towards growth, towards wholeness and self-perfection.' Koestler⁸ mentions the '*facultas formatrix*' of Kepler and Galen, Galvani's 'life-force', Leibniz's 'monads', Goethe's 'Gestaltung' and Bergson's '*élan vital*'.

Driesch's 'metaphysical' notions were, of course, opposed by biologists with a materialist outlook, who had faith that physical and chemical mechanisms would be seen, as knowledge expanded, to be entirely sufficient to account for the observed behaviour of living matter, without the need to postulate intangible quasi-theological concepts. The astonishing progress made in the biological sciences during the twentieth century, in particular the discovery of the molecular basis of genetics and the elucidation of the intricate biochemistry underlying the structure and behaviour of living cells, appears to have amply vindicated their faith, and Driesch's 'entelechies' are relegated to the status of historical curiosities.

Joseph Needham's⁹ staunch support for the materialist view appeared in 1936. It has become a classic. Needham's insight into the physical and chemical processes of morphogenesis is remarkably profound; many of his speculations have been borne out by later investigations employing advanced techniques that did not exist when the book was written. Driesch's 'entelechies' he attacked unmercifully. The style of attack is characteristic of materialist's denouncements of anti-materialist speculations. It contains various logical errors and false epistemological principles:

In the first place it cannot be too strongly emphasised that there is neither logical nor empirical basis for the supposition that 'material' entities such as atoms and molecules are the ultimate basis of observed reality, nor for the supposition that the presently known principles that govern their behaviour are the only principles by which observed reality operates. These are *suppositions*, based on *faith*. Scientific investigations have so far tended to support these suppositions, but that may be because, by and large, support for them is what the investigations have been designed to seek. They are fruitful *heuristic hypotheses* that have served science well, but the knowledge they have helped to reveal could be knowledge of only a particular aspect of reality. There is a well-known Jain parable in which five blind men investigate an elephant. One feels its trunk and comes to the conclusion that an elephant is like a snake. To the one who feels its leg, it is like a tree; to the one who feels its ear, it is like a winnowing basket; to the one who feels its tail it is like a rope. The fifth man feels the roundness of its belly and concludes that a elephant is like an enormous barrel. They commence to argue passionately, each defending his own conviction.¹⁰

In support of his dismissal of Driesch's entelechies, Needham cites the writings of the logical positivists. Their attempts at 'purification' of scientific terminology led them to conclude that words were meaningful in science only if they could be reduced to incorporation in the 'physical language' by which they meant language based on direct experience. "This was not the case, however, with words like 'entelechy', which are incapable of formally correct definition, and hence can occur only in meaningless statements."¹¹ Thus, Needham is accusing Driesch of introducing concepts not amenable to scientific investigation and 'therefore' [!] meaningless. He refers to "the remarkable animistic and anthropomorphic tendency noticeable in Driesch's concept of an 'arranging agent' " and says that "for centuries science has struggled to rid itself of the remains of popular demonology."¹² There is some similarity here to the behaviourists' attitude to the word 'mind' and to 'mentalist' concepts: "since mental or psychic events are asserted to lack the dimensions of physical science, we have an additional reason for rejecting them."¹³

The implication of arguments of this kind is that any hints of mysterious 'non-material' entities have no place at all in science — or indeed in the 'real world' that science investigates. But are not such things as 'electricity' and 'magnetism' mysterious non-material entities that turned out to be amenable, on further investigation, to scientific exploration, and intelligible in terms of their observable effects? Why

should we suppose that Drieschian entelechies, if they exist, would not likewise yield to scientific investigation in terms of their observable effects? And even if it should turn out that some aspects of reality are in fact, by their nature and by the *nature of scientific investigation*, not amenable to scientific investigation — a prospect that is, after all, *possible* — why should we not at least acknowledge their existence?¹⁴

Belief systems carry within themselves certain unquestioned, and indeed undiscerned, metaphysical assumptions. ‘Rational’ arguments purporting to demonstrate the ‘truth’ of a belief are susceptible to irrationalities deriving from unquestioned assumptions. Materialistic belief systems are no exception. Whether the phenomenon of life on Earth is nothing but an incidental consequence of the mechanistic action of molecules in space and time, or whether it is something more, is not a matter of ‘rationality’ versus ‘irrationality’. It is a question that can be resolved only on the basis of empirical evidence, not on the basis of philosophical arguments.

In the nineteenth century physicists saw the world in terms of mechanical actions of matter, governed by strictly deterministic causality. Many biologists, on the other hand, faced with the bewildering complexities of the living world, saw everywhere evidence for ‘vitalistic’ and ‘teleological’ organising principles, transcending the mechanistic laws of physics. A curious feature of the history of science during the twentieth century has been the very noticeable *interchange* of these positions. The biological sciences became more and more ‘mechanistic’ at the same time that physics, forced to abandon determinism and faced with the bewildering complexities of the physical world, gradually came to realise that ‘matter’ itself is only an epiphenomenon of fluctuating probabilities carried by elusive *non-material entities*.

Lamarckism

We have seen, in the previous section, an example of how speculative hypotheses that go against the grain of the mainstream of scientific thought fall into disrepute, and of the kind of arguments put forward to discredit them. Another example is provided by Lamarck’s hypothesis, that the ‘inheritance of acquired characteristics’ might be a contributory factor in evolution — one of the means by which a species adapts itself to the environment. In the early days of evolutionary theory the idea had many supporters. Darwin himself was one of them.

With increasing knowledge of the way morphological characteristics are inherited, Lamarck’s hypothesis began to look

extremely unlikely. Inherited characteristics are passed on from generation to generation by the genes. As Weismann was the first to point out, it is inconceivable that an individual's genes can in any way be affected by morphological and behavioural changes that are incidental consequences of events in the life of the individual. The translation of genetic information that produces an organism is asserted to be a strictly one-way process (from 'genotype' to 'phenotype'). Modern knowledge of the molecular basis of genetics appears to confirm Weismann's views entirely, rendering Lamarck's idea incredible.

In view of this, it is surprising, to say the least, that biologists who nevertheless persisted in clinging to Lamarck's obsolete idea continued to produce experimental evidence that life experiences of a group of organisms, if they persist for several generations, *can* in fact produce appropriately adaptive genetic responses.

When what seems 'inconceivable' or 'incredible' is nevertheless observed to occur, it could simply be that human imagination has failed to appreciate the full range of modes of operation that are available to Nature.

The Austrian biologist Paul Kammerer was a superbly gifted individual, with a special talent for caring for and breeding amphibians and reptiles. His experiments at the Institute of Experimental Biology in Vienna began in 1903 and continued for fifteen years. When the experiments began he was convinced by Weismann's arguments. His experiments with spotted salamanders (*Salamandra maculosa*) extended over eleven years. These animals have black and yellow skin markings, the pattern of which can change at a slow rate during their lifetime. The animals were divided into two groups, one of which was reared on yellow soil, the other on black soil. The slow pattern-changes serve to enhance the effect of camouflage; the yellow areas or the black areas come to dominate according to the predominant colour of the animal's surroundings. Kammerer found that when the next generation appeared, the enhanced effect was already present — the infants already possessed the colour adaptations that their parents had acquired gradually. Moreover, the camouflage became more effective with each successive generation. Thus: *the inheritance of an acquired characteristic*.

The pattern changes that take place during the lifetime of a spotted salamander are known to be a response to what the animal sees; the visual cortex presumably produces chemical messengers that carry information to the pigment cells of the skin. Clearly, if these chemicals enter the eggs of the mother salamander, her offspring would be

expected to respond to them as they develop. Thus, in this particular case, there is a conceivable mechanism for the inheritance of an acquired characteristic, that does not involve the genes. It is difficult, though, to see how this hypothesis could account for the increase of the effect over several successive generations.

Another series of Kammerer's experiments involved the midwife toad (*Alytes obstetricans*), so called because of the way the male toad, after mating, attaches the eggs to his hind legs and carries them around until they hatch. Some species of toad breed in water, others breed on dry land. In the water-breeding varieties the males have rough, spiny pads on the palms of their hands that help them hold their mates more securely in the water while mating. *Alytes* mates on land and has no 'nuptial pads'. Kammerer succeeded in persuading his *Alytes* to mate in water, for five generations. Nuptial pads developed on the hands of the males. *The pads became more well-developed in succeeding generations.*

The sea-squirt (*Icon intestinalis*) lives on the sea bed and has two siphons — hollow tubes — projecting from it. It feeds on plankton by sucking water through one siphon and expelling it through the other. If the siphons are cut off, they regenerate. The regenerated siphons are longer and slimmer than the originals. If they are again cut, the next ones are still longer. In this way, one can produce sea-squirts with siphons like 'monstrous long elephant trunks'. Kammerer found that this characteristic — the possession of abnormally long siphons — is hereditary. He regarded these experiments as the most conclusive of all his experiments; they demonstrate most clearly the inheritance of an acquired characteristic.

Throughout his career, Kammerer's work, and his integrity as a scientist, were attacked by neo-Darwinists. The attacks came mainly from the renowned English Darwinian evolutionist William Bateson, whose opposition to Lamarckian ideas was quite pathological. During the first world war Kammerer's laboratory assistants and trained keepers were called away to military service, the experimental animals died and most of Kammerer's preserved specimens — the precious material evidence of his painstakingly acquired results — perished. All that was left were a few microscope slides and photographs and a single preserved specimen of a sixth generation male *Alytes* with his nuptial pads in the process of developing. The inflationary catastrophe that hit Germany in the 1920s meant financial ruin for Kammerer. He continued to lecture and publish. Bateson's campaign against him intensified and degenerated to blatant insinuations of fraud and charlatanny. Bateson declined to examine the nuptial pads of the *Alytes*

specimen when he had the opportunity to do so during Kammerer's visit to Cambridge in 1923. The final blow fell when some unknown person tampered with the *Alytes* specimen in a crude, but sadly successful, attempt to discredit Kammerer.

Paul Kammerer shot himself on 23 September 1926. Though he was one of the most brilliant biologists of the twentieth century, his work is now disregarded — most textbooks of biology and evolutionary theory don't even mention him. No attempts have ever been made to repeat his experiments.¹⁵

Is there evidence for the inheritance of acquired characteristics that can be seen in the natural products of evolution, without recourse to experiments? Various instances have been cited. Consider for instance the fact that the skin on the fingers of a guitarist become tougher — an obvious 'acquired characteristic'; skin has a natural capacity to respond to stress, and there is no great difficulty in seeing how the genetic basis for this capacity could have arisen in the neo-Darwinian scheme. It might seem natural to assume that the fact that the skin on the soles of our feet is thicker than elsewhere is analogous. However, the skin on the soles of the feet of a new-born infant is already thickened. That is quite puzzling. Is it conceivable that our very distant pre-human ancestors were all born with tender feet until, just by chance, mutations kept cropping up that happened to produce tougher feet, until all the tender-footed individuals got weeded out by natural selection, because they were 'less fitted to survive'? Neo-Darwinists will accuse me of putting forward a travesty of their explanations, but nevertheless, this scenario is in essence what they are proposing. And if the mutations are really random, did individuals keep appearing who 'just happened' to have thickened skin on their noses or ears? And if chance mutations 'fortuitously' provided us with thickened skin just where it is needed, why did this kind of unlikely good fortune come about again and again, in many different species, so that ostriches are born with tough pads on their underside, fore and aft, just where they are needed for comfortable sitting, and camels are born with pads on their knees, just where they will be needed for comfortable kneeling on the sand?¹⁶

Ever since Darwin introduced the phrase 'survival of the fittest' Darwinians have been plagued by the need to define what they mean by 'fitness'. The obvious answer, that the fittest life-forms are those that survive, produces a tautology, and plainly will not do. Neo-Darwinists hit on the idea that 'fitness' in an organism, in the context of Darwin's theory, is essentially the effectiveness of its ability to produce

offspring; the fittest organisms are asserted to be those most likely to leave descendants:

By fitness is simply meant the probability of survival and reproduction.¹⁷

The characteristics themselves do not directly matter at all. All that matters is who leaves more descendants over the generations.¹⁸

Or, *obscurum per obscurius*,

The fitness of a population is the degree to which its gene pool gives it the ability to find some way or other of leaving offspring in the temporally and spatially heterogeneous range of environments which its dispersion mechanisms offer to it.¹⁹

In the sense that populations that have failed to keep on producing offspring are the ones that have become extinct, producing offspring is, trivially, a necessary component of what Darwin meant by fitness. But to *define* Darwinian ‘fitness’ in these terms is, again, tautological.

It seems clear to me that the term ‘fitness’ as Darwin used it means *adaptability* — the capacity of a population to respond in a purposeful way to changing environmental circumstances. The most glaringly obvious fact about evolution is that it is a dynamic process of adaptation to ever-changing environmental factors, wherein every species is a factor in its own environment. Evolution is the adaptive self-interaction of the biosphere. The myriads of adaptive strategies and structures are wonderfully precise and efficient — they are not haphazard. D’Arcy Thompson²⁰ discussed the skeletons of vertebrates and demonstrated that their structural organisation and the forms of the bones that comprise them can be understood in engineering terms. He pointed out that they are *very precisely* adapted to the stresses that are imposed on them in the life of the adult organism. Yet skeletal structures are formed in the embryo *before* the stresses are imposed. Neo-Darwinism has no feedback mechanism to account for this — no way for environmental stresses imposed on the skeletons of adult vertebrates to affect the genes that produce the skeletal structure. It offers by way of ‘explanation’ only a haphazard process of trial and error driven by blind chance, with the results of the least successful trials eliminated by the equally haphazard effects of continually

changing environments. This is, surely, putting a stupendous burden on the laws of probability that they just *cannot* support.²¹ Lamarckism is simply an acknowledgement that the fact of evolution indicates the existence of feedback, and an acceptance that how it operates remains, at present, mysterious.

Mechanisms produced by the application of a cumulative process of unintelligent and purposeless trial and error and the discarding of the results of unsuccessful ‘trials’ — those that don’t work at all — would be expected to be, at best, rather clumsy makeshift contraptions that function merely adequately. If, as asserted by neo-Darwinism, living organisms *are* such mechanisms, we might expect to encounter everywhere various meaningless characteristics serving no useful purpose whatever and making no sense.²² In fact, on the whole, living organisms exhibit *superb* adaptations to their way of life and marvellously complex solutions to the problems of ‘making a living’, that are often *optimal* rather than merely serviceable.²³ (The argument at this point begins to resemble Paley’s famous and often scorned ‘proof of the existence of God.’²⁴ Nevertheless, it is a crucial and significant point, that merits attention.)

Let us now return to the analogy that Darwin drew between artificial selection and natural selection. It is quite a crude analogy. When the plant or animal breeder selects, he makes an *intelligent* choice of those members of the population that happen to be superior in the *specific* characteristic or characteristics he is interested in. He then breeds *only* from this selected group, discarding the rest, and repeats the process in successive generations. *Natural* selection, on the other hand, only weeds out the least ‘fit’ — the ill-adapted members. *Adequacy* is being selected for, *not* a specific characteristic. Particularly ‘desirable’ varieties are not picked out when they crop up, they simply continue to breed with the general population and to take their chances along with it. The general population doesn’t become ill-adapted on their account. The two kinds of ‘selection’ thus operate quite differently.

Now consider what would happen to a homogeneous population of near-identical individuals, subject now and then to random mutations. Clearly, the homogeneity would be lost; generation after generation, an ever-increasing variance in a multitude of characteristics would arise. *Natural* selection would of course eliminate defective varieties, but would not limit the increasing heterogeneity — there are, after all, innumerable ways of being adequately adapted to an environment. This is, of course, not what is observed: the differences between individuals of a species always lie within quite narrow limits.

Neo-Darwinism has no means of imposing this observed *stability* on the homogeneity of a species.²⁵ From time to time, environmental changes would produce a shift in overall population characteristics, as individuals ill-adapted to the new conditions perished, but the inexorable increase in variance (heterogeneity) would not be halted, and there would be no reason to expect these shifts to be in the direction of *ever-increasing complexity*, let alone in the direction of *optimal* adaptive structures and strategies.

Evolution is not just a fair dream of the last century, the century of Lamarck, Goethe and Darwin; evolution is truth — sober, delightful reality. It is not merciless selection that shapes and perfects the machinery of life; it is not the desperate struggle for survival alone that governs the world, but rather out of our own strength everything that has been created strives upward towards light and the joy of life, burying only that which is useless in the graveyard of selection.

— Paul Kammerer²⁶

Sheldrake's Hypothesis

In the 1920s the Harvard psychologist William McDougall began a series of experiments with rats to determine whether learned skills could be inherited in a Lamarckian way. The experimental equipment was a T-shaped arrangement of dark tunnels through which the rats were required to swim. On reaching the T-junction a rat was faced with a choice. At the end of one arm of the T was a light. The natural impulse of an inexperienced rat would be to swim towards the light, which appeared sometimes to the right and sometimes to the left. On average, the first generation of rats needed to swim through the T over two-hundred times before they realised that they would get an electric shock on reaching the light but would reach the exit if they swam into the dark. In 1938 McDougall published results that showed that the rats learned quicker in succeeding generations. After 22 generations McDougall's rats were understanding the situation after only about twenty attempts. The experiments appeared to demonstrate quite clearly that rapidity in learning the experimental situation was an acquired characteristic that is inherited.²⁷

The Scottish researcher Crew set out to disprove McDougall's 'incredible' results. To his surprise he found that his rats were *already* as smart as those of McDougall's final generation, right at the start of

his experiments — some even swam into the dark tunnel straightaway, and never received a shock. Agar carried out similar experiments in Australia, with similar results. Agar's experiments continued for 25 years, accumulating evidence for Lamarckian inheritance of learned responses.²⁸

Is it possible that acquired characteristics can not only be inherited, but also propagated throughout a species by some kind of telepathic action at a distance? This is what Crew's experience seems to suggest, and there are numerous other examples drawn from the history of laboratory experiments on learning in rats, pigeons and other animals, that point to the same conclusion: skills that are acquired slowly by 'trial and error' in the early days of such experiments are acquired more rapidly and efficiently in modern experiments — the animals are now 'smarter' at the kind of learning expected of them. These findings appear frankly ridiculous — they seem to contradict accepted ideas of what is possible far more radically than did Lamarck's hypothesis. Nevertheless, Rupert Sheldrake was able to find various phenomena in the biological world that appear to indicate just such an effect. He postulated the existence of hitherto unknown principles at work in nature, which he called 'formative causation' or 'morphic resonance'.

As was to be expected, Sheldrake's 'little occult fancies' were roundly denounced as 'balderdash' by most of the scientific community. According to an editorial in *Nature*, Sheldrake's book, *A New Science of Life*, in which he discussed his hypothesis and surveyed various biological facts that seem to support it, was 'the best candidate for burning there has been for many years.'²⁹

What is going on here? Why do otherwise rational and intelligent scientists overreact in such an absurd way when ideas or alleged facts challenge what they have come to believe? Is it not possible, in science, to set aside one's beliefs and to simply *consider* strange ideas, to examine their implications and test them against reality? I would maintain that it is not only possible, it is an essential ingredient of scientific progress. Either Sheldrake's hypothesis is false, in which case it should be disproved and rejected, or it is true, in which case we would have to conclude that the present paradigms that science has erected have missed some crucial feature of the way the world operates, and a major revolution in scientific thinking would emerge. Either way, what is there to fear?

According to Sheldrake, a community of organisms, or even a whole species, can be regarded as a system responding to the influence of organising agencies that he calls 'morphogenetic fields' or 'M-

fields'. These are not to be thought of as propagating in space and time according to the usual concept of a physical 'field'. If we think of them acting on a developing multicellular organism — a community of single-celled organisms — they are the same thing as Driesch's *entelechies*. Sheldrake's view is quite close to Plato's notion of a world of 'ideal Forms' that underlies and gives rise to the phenomenal world. It also has much in common with the ideas of the theoretical physicist David Bohm³⁰, who postulated the existence of a level of reality that he calls the 'implicate order', that gives rise to the phenomenal world and its 'laws' by a process of 'unfolding'. Bohm's ideas are motivated by his profound thinking about the anomalies and paradoxes of quantum physics, which led him to conclude that what we think of as physical reality is in fact some kind of epiphenomenon. Sheldrake's very similar views arose from considering biological phenomena. His M-fields would operate at the level of Bohm's implicate order, a level at which a community or a species is in some sense a single entity, that manifests itself at the 'explicate' level as the separate individuals of the community or species. According to Sheldrake, it is this entity that evolves: it also *learns* by a process of feedback from the 'explicate' level.

Sheldrake has drawn attention to various instances of knowledge acquired by a few individuals being rapidly transmitted to the whole species in a manner that transcends 'normal' channels of communication. One such instance concerns a widely observed behaviour pattern of blue tits (*Parus caeruleus*). In Britain, milk used to be delivered in bottles left outside homes in the early morning. In 1952, thin metal foil was introduced for the caps of milk bottles. The blue tits soon discovered that they could tear the foil and get at the cream. The habit began in London and rapidly spread throughout the south of England. By 1955 blue tits throughout Europe and also many great tits (*Parus major*) had acquired the habit. It was as though, once enough birds had acquired the item of knowledge, a critical threshold was reached and then the whole species, throughout a vast geographical region, had access to it. The 'normal' processes of propagation of a new trick — parents teaching it to their young or observation of a bird's behaviour by other birds — seem inadequate to account for the *rapidity* of the process.³¹

According to Lyall Watson³² a very remarkable example of this mysterious process of acquiring knowledge was observed by researchers studying macaque monkeys (*Macaca fuscata*) on the Japanese island Koshima. The researchers started to feed the group of monkeys by leaving sweet potatoes for them on the beach. The

monkeys did not know at first how to deal with the unpleasant fact that the potatoes got covered in sand; they would attempt to brush it off but did not find this very effective. An 18 month old female, Imo, then discovered that the sand could be completely removed and an interesting salty taste imparted to the potatoes by dipping them in the sea. She taught the trick to her mother and her friends and gradually the habit spread to most of her community. Imo also discovered that rice could be separated from sand by throwing it into a pool — the sand would sink and the rice would float and could be skimmed off the surface. She also taught this trick and it was gradually adopted by most of the community.³³ Lyall Watson tells of further developments that the researchers were reluctant to report because they ‘would not have been believed’: communities of monkeys on other islands and on the mainland spontaneously took up the habit of dunking food in the sea. Sheldrake was cautious about putting Watson’s testimony forward as evidence for his hypothesis, because of its ‘anecdotal’ nature.³⁴

Sheldrake extended his hypothesis of ‘morphic resonance’ to include inanimate matter. His claim is that the action of M-fields is present in various situations involving form and pattern in arrangements of matter, not just in biological systems. As evidence, he cites various instances of a phenomenon associated with crystal growth, that is something like a *learning* process. For example, a company growing large crystals of the *anhydrous* variety of ethylene diamine tartrate in the 1950s found that they were completely unable to produce the crystalline *monohydrate* variety of the same substance. A year after production of the anhydrous crystals began, misshapen crystals started to appear spontaneously in their growing-tanks, which turned out to be the monohydrate crystals they had been trying in vain to produce. At about the same time, monohydrate crystals began appearing elsewhere, even in other factories. The analogy with propagation by ‘action at a distance’ of a learned response is quite striking. Other instances of crystalline substances behaving in this odd way show that this case is not an isolated anomaly.³⁵

Crystals occur when molecular units cluster in a regular pattern, which then grows as additional units attach themselves to it. The mechanistic actions of matter are sufficient to account for the growth of a crystal, once the initial cluster has been formed. The initial cluster or ‘seed’ determines the molecular arrangement of the whole crystal. Sheldrake’s hypothesis does not deny this, but regards a particular crystalline arrangement, wherever it occurs, as a manifestation of information present at the level of Bohm’s implicate order. Once a particular crystalline form has established itself, by

chance to begin with, the information can be transmitted by the M-field, causing seeds with the appropriate morphology to be more readily formed wherever the necessary physical conditions arise.

Only one attempt seems to have been made to test the hypothesis under controlled laboratory conditions. Varela and Letelier³⁶ carried out an experiment with silicon chips. Though not crystals, silicon chips are pieces of matter complexly organised at the molecular level. The results were negative: a particular form of silicon chip showed no tendency to grow any quicker after millions of repetitions — the silicon did not ‘learn’. Of course, it can quite legitimately be claimed that this experiment is not a test of Sheldrake’s hypothesis at all, that the experimenters had misunderstood what Sheldrake was saying. The hypothesis does *not* suggest that the *rate of crystal growth* can be influenced by the M-field, nor would it imply any effect on the rate of formation of a silicon chip. The hypothesis is that the *probability of spontaneous occurrence* of a particular form is influenced by the M-field, and that is not at all the same thing.

The normal mechanisms of crystal growth are not adequate to account for the existence of *quasicrystals*.³⁷ The molecular arrangement in a quasicrystal is rather like a three-dimensional jig-saw puzzle that cannot be assembled by blindly putting it together piece-by piece without some kind of larger-scale recognition of the pattern and a great deal of planning ahead. Penrose³⁸ has suggested that this unsolved problem of physics can be better understood by appealing to quantum physics. He presents a picture of quasicrystal growth in which *all possible ways* of extending the growing molecular pattern are simultaneously present in a superposition of states. The transitions would select those states that correspond to patterns that are capable of consistent extension. Thus a holistic pattern-organising process would operate, that seeks out appropriate ways of proceeding — an activity that seems to me to be akin to the hypothetical action of Driesch’s entelechies, Sheldrake’s M-fields and Eccles’ ‘consciousness’. These hypotheses are all expressions of a single persistent idea: *the idea that some aspects of the world — in particular its self-organising, complexity-creating and exploratory purpose-formulating aspects — are not just artifacts of the mechanical action of atoms.* Motivating and supporting this idea is a considerable body of observational evidence.

Collective Cognition

There are biological phenomena in which whole communities appear to have access to knowledge that is not possessed by any single

individual; the individuals act together under its influence, as if controlled by a single ‘mind’. Some instances of this leave materialistic explanatory principles helpless and strongly suggest the operation of something like an entelechy or an M-field. Consider, for example, the slime moulds.³⁹

The individuals of *Dictyostelium discoideum*, a species of slime mould, are amoebae, simple one-celled creatures that lead solitary lives in the dampness of the forest floor, eating bacteria and reproducing by cell division. However, when food becomes scarce, something quite astonishing happens. As if in response to a signal, they start to congregate together. A large number of individuals — typically half a million — start to move towards a central point. Within minutes, a dense filamentary colony takes shape. Eventually it becomes a well-defined cylindrical slug-like entity known as a ‘grex’ — a primitive multicellular organism about a millimetre long. The grex creeps and wriggles around, often for several weeks, searching for a warm, bright place. Its structure is not amorphous; the cells at the ‘head’ end become specialised to take care of the perceptual task. John Bonner of Harvard University stained the head of a grex and transplanted it to the tail end of another. The stained cells moved through the body of the second grex until they had found their proper place in the ‘head’!

When a suitable locality has been found the grex undergoes another amazing transformation. The members of the colony become differentiated for specialised tasks. The whole grex turns into a vertical stalk with a spore capsule at the upper end. When the spores are released, each one splits and becomes a tiny new amoeba.

The gathering together is initiated by a chemical message,⁴⁰ perhaps emitted in the first place by a single amoeba and then by its near neighbours as they receive the call. The whole colony, guided by the chemical gradient, would then move towards this group. But then how does each cell ‘know’ which particular specialisation it has to adopt? The spontaneous appearance of organised structure in an amorphous collection of units is quite baffling and poses a severe problem for all ‘normal’ modes of explanation. The individual cells are, of course, only apparently identical — there is a range of genetic types in the population, as in any other species — so the specialisations may be genetically predetermined.⁴¹ Nevertheless, it is well-nigh impossible to imagine how random mutations and natural selection alone could have given rise to the integrated behaviour pattern of the whole population, arising from the interrelated behaviour characteristics of a number of different mutant varieties. Especially intriguing is the appropriate response of the grex to Bonner’s interference. We can, I

think, safely assume that having its head transplanted onto a tail is an experience that no grex had ever encountered in the natural course of evolution!

For a second example, **consider the termites**. These insects construct towers above their underground colonies. These towers are elaborate structures incorporating passageways and air-vents; they often reach considerable heights. They are assembled from millions of tiny grains of earth, each covered by a sticky mucilage that hardens to a cement, and each is placed in position by a single termite. It would be absurd to suppose that any individual insect has any conception of the overall plan of the structure, yet the highly organised structure emerges from the busy activity of millions of insects, as if by magic:

No reasonable person can imagine for one moment **that every small worker is conscious of the purpose of its work, that it carries in its mind the plan, or even part of the plan of the building operations**... Its work is naturally due to instinct, but it is not the instinct of the worker. It is the instinct and design of a separate soul situated outside the individual termite.

— *Eugène Marais* ⁴²

Marais was a naturalist of remarkable originality, who lived and studied in Africa about eighty years ago. **He did experiments in which he severely damaged termite mounds, dividing them into two separate halves between which he inserted a metal sheet.** The termites would set about the task of repairing the damage. **Although the steel sheet prevented communication between the workers on either side, Marais found that, when the steel plate was removed, the structures on either side matched accurately!**

We cannot escape the ultimate conclusion that there is a preconceived plan which the termites merely execute.

— *Eugène Marais* ⁴³

Examples like these indicate particularly clearly that something more than chemical mechanism is operating in the biological world; **something that acts holistically and teleologically**, something that ‘cognises’; something that explores possibilities, formulates goals and strategies for achieving them; something that has provided camels with their padded knees, bats with their sonar equipment, spiders and termites with their engineering skills, and ourselves with our imagination, curiosity and creative potential. I do not share the defeatist

attitude of those who maintain that these ‘vitalistic’ aspects of biology necessarily lie beyond the reach of possible understanding, nor the related materialistic opinion that they are necessarily illusory. But understanding of a phenomenon can arise only on condition that its existence be acknowledged, and appropriate methods of investigation and *appropriate ways of thinking* worked out.

Perhaps the watchmaker is not blind.

Morphogenesis

Every multicellular organism begins life as a single cell, which develops into a cluster of seemingly identical cells by growth and repeated subdivision. At a certain stage the cluster begins to organise itself. It goes through astonishing sequences of transformation, becoming more and more complexly structured as the individual cells become increasingly differentiated and specialised, adopting the behaviour and morphology appropriate to their purpose in the overall structure. This is morphogenesis — the awe-inspiring and inconceivably intricate process whereby a single cell develops into a mature organism — a giraffe, a tree, a human being, or a mosquito, according to the particular genetic message that the original cell contained encoded in its DNA.

Molecular biochemistry has made spectacular advances in recent decades — science has provided fascinating insights into the biochemical mechanisms underlying cell behaviour. It is known that every single cell of a multicellular organism carries in the DNA of its nucleus a *complete replica* of the genetic message that was present in the original single cell from which the organism developed. The increasing specialisation of the cells comes about because each cell makes use, at any given developmental stage, of only a portion of the message — the rest is inhibited by the action of enzymes. At any one time the active portion of the DNA in a cell is responsible for the particular proteins the cell manufactures. Some of these proteins are structural — they are the materials out of which cell walls and membranes are built — while others, called enzymes, govern the chemical activities that go on in the cell. Thus, the active portion of the genetic message determines the structure, behaviour and growth of each individual cell. In this way, the genes govern not only morphogenesis, but continue throughout the life of the organism to direct the intricate metabolic processes that make life possible.

An enormous amount of detailed knowledge of these intricate molecular activities has accumulated over the years. However, the awesome complexities of multicellular organisation are far from being well understood. There are tremendous *hierarchical gaps* separating the lowest level (cell biochemistry), the intermediate levels (the formation of intricately-structured tissues and organs) and the topmost levels (the integration of the activities of many millions of cells to produce a functioning system — a living creature).

A fundamental question is: how does any particular cell ‘know’ its position in the overall scheme so that it can behave appropriately — activating or suppressing the genes that govern its chemistry at exactly the right time? In other words, what is the nature of the communication system between cells, that enables them to act collaboratively? A partial answer is provided by various chemical ‘messengers’ such as hormones that can enter a cell from its immediate environment and trigger the necessary DNA-controlling mechanisms. The spontaneous formation of the complex patterns characteristic of specialised tissue is, however, an amazing phenomenon that is very far from being adequately understood. The capacity of cells to recognise their own kind and congregate is a very general phenomenon. Dissociated kidney cells will come together and reassemble themselves into the pattern of tubercles typical of kidney tissue and begin to secrete kidney enzymes. Liver cells and retinal cells have been found to behave analogously. Heart cells have been observed to coalesce to form rhythmically contracting muscle tissue.⁴⁴ If a living sponge is dissociated into separate cells by pressing it through a fine sieve, the cells have been observed to coalesce and then to reconstitute a whole new sponge.⁴⁵ As we have already seen in the case of the slime moulds, the reconstitution of complex structure from dissociated cells is also a naturally-occurring phenomenon.

At a higher hierarchical level the communication network can be viewed as a dynamical entity, a web of information carried by chemical gradients and electrostatic potentials, creating and governing specialised cell regions and created and governed by them. In the sense that ‘information’ is abstract and ‘non-material’, this conventional and generally accepted view is not so very different from Driech’s entelechy concept! the patterns of information underlying embryonic development are referred to by embryologists as ‘morphogenetic fields’ (Sheldrake’s more recent adoption of this term to denote a wider and more controversial concept is perhaps unfortunate). The developing organism thus lifts itself up to greater and greater levels of complexity, ‘by its bootstraps’.

Many aspects of morphology are not genetically determined in any direct way. The shapes of organs and the morphological patterns of tissues are to a great extent governed by physical forces. They are the result of the action of stresses set up by differential growth rates — the shapes develop as a result of these stresses and are a matter of the viscous and elastic properties of materials. This aspect of the morphology of living things was first emphasised by D'Arcy Thompson.⁴⁶ Also notable is Helmut Schwenk's⁴⁷ observation of similarities between organic forms and forms seen in turbulent fluid flow and even in geological formations. These similarities are almost certainly not coincidental, but a manifestation of homologous mathematical laws.

If the reductionist view of biological systems is correct, then morphogenesis is entirely a result of mechanical molecular encounters. According to this view the whole morphogenetic process can in principle be accounted for by *already known* physico-chemical laws and unfolds as a result entirely of the inexorable deterministic operation of those laws; the first cell from which the organism develops, provided it has the right kind of environment, is then *sufficient cause*, by virtue of its physical constitution, of the entire subsequent process that builds the total organism. There is then no need for the intervention of any control by an 'entelechy'. This reductionist view is quite compelling — it seems to dispel the mystery that for so long shrouded the phenomenon of life, and to render it at last intelligible. And that, after all, is the purpose of scientific explanation: to penetrate mysterious phenomena and render them intelligible. A component of the opposition to the reductionist explanation stems from a misplaced romanticism, a love of mystery for its own sake which is nothing more than a love of ignorance.

A more serious objection to reductionist 'explanations' is that they don't really *explain*. They only impart to a rudimentary and partial understanding the false appearance of complete understanding — of having got to the root of the problem. The elucidation of the structure of DNA by Watson and Crick and the subsequent decipherment of the genetic code⁴⁸ was greeted in many quarters by the euphoric proclamation that the secret of life now stood revealed. This is very much like claiming to understand computers because you can do binary arithmetic or to understand music because you can play 'God Save the Queen' on a penny whistle. Biochemical knowledge is a *basis* for the *beginning* of an understanding of living things. The fundamental mysteries remain, and they are immense. *Why* is it that what we regard (perhaps erroneously) as the fundamental constituents of physical

reality — molecules, atoms, quarks, quantum fields or whatever — possess the miraculous property of being able to build themselves up, *apparently* all by themselves, into ever-increasingly complex hierarchical systems — cells, plants, animals, societies, ecosystems (not to mention things like languages, ideas, religions and scientific theories)?

In attempting to understand morphogenesis holistically rather than at the molecular level, one finds a lack of adequate *theoretical* concepts. Faced with complex morphological transformations, science has not gone far beyond the stage of collecting descriptions of observed facts — the preliminary stages of any new science. A few beginnings have been made towards the development of a theoretical approach to morphology. D'Arcy Thompson's⁴⁹ method of comparing related biological forms by deformations of a co-ordinate system was such a beginning but has not been much exploited — it is regarded only as an interesting curiosity. Thompson illustrated the method with examples that compared the overall shapes of related species, and demonstrated by its means sequences of evolutionary changes of form, but it could clearly be applied just as effectively to morphogenetic change. Simulation techniques based on the principles of differential geometry combined with computer graphics could obviously become a powerful tool for investigating the generation of form from morphogenetic fields — e.g. from the distribution of growth rates throughout a material.⁵⁰ Thom's catastrophe theory also throws some light on the dynamical aspects of morphological transformation.⁵¹

The belief that life is nothing more than a mechanistic process is rather odd, for the following reason: since life is asserted to be a manifestation of physical laws, wouldn't the known fact that the really fundamental physical laws are *not* mechanistic be expected to have *some* implications for biology? Mechanistic 'explanations' of life have to appeal to the argument that the indeterminacies of quantum physics have no effect on biochemical interaction so that cell biochemistry can be legitimately regarded as a 'classical' system — i.e. as a mechanistic system. Wigner⁵² has cast serious doubt on this assumption, maintaining that DNA replication and the randomness inherent in molecular processes predicted by quantum physics are not mutually consistent; the quantum fluctuations of atoms would be sufficient to disrupt the replication process after only a few replications. There must, then, be undiscovered laws ('biotonic' laws) whose operation damps down the quantum fluctuations and so ensures the stability and precision of the processes of cell-division whenever a multicellular

organism develops, and the maintenance of genetic stability of a species over millions of years.

Wigner's arguments have been criticised,⁵³ but they appear reasonable. If they are correct the conclusion is that the stability of biological systems is not accounted for by *known* physical laws. Moreover, once the existence of Wigner's 'biotonic laws' is acknowledged as a possibility, the implication is that the 'random' events (transitions, or quantum fluctuations) that are a basic ingredient of quantum theory underpinning its 'probabilistic' interpretation are, in living matter, *not* random:

... Quantum theory has certainly been a gigantic step forward. Nevertheless, it contains the tacit metaphysical assumption that when the quantum state is determined, then the fluctuation in the behaviour of individual atoms is *completely random*, and must remain so, no matter what question the physicist may come to inquire into, nor what conditions may come to be established for those atoms. So, in effect, there is an assumption of a *law of lawlessness* (which is evidently in some ways an inherently self-contradictory notion). Would it not be more reasonable to suppose instead that the behaviour of individual atoms is fortuitously related to the quantum state, and that it might therefore be non-fortuitously related to other things (some of which may perhaps be thought of only in the future)?

— David Bohm⁵⁴

If Wigner is right, then some *unknown* aspects of nature, over and above known physico-chemical mechanisms, are indicated by the stability and precision of the chemistry of life. In other words, molecules do not create life 'all by themselves'.

The *precision* of morphogenetic processes raises questions of a different kind, that also appear to be unanswerable in terms simply of genetic control of physico-chemical processes. To account for morphogenesis in this way, we have to consider the *precision timing*⁵⁵ of the repression and activation of genes in every cell throughout the developing embryo. It is not difficult, in general terms, to conceive of the *initiation* of growth and cell specialisation in genetic terms, as when a limb bud, in response to a chemical 'start' signal, activates the genes responsible for generalised limb-formation and then at later times, in response to further chemical signals initiated in various parts of the limb, cells become increasingly more specialised as bone-cells, muscle-

cells, etc. In an interesting experiment performed by Lewis Wolpert⁵⁶ a group of cells from the thigh-region of a hind limb-bud of a chick embryo was transplanted onto the end of the developing wing. It developed into a claw. Apparently, the cells had already received the message that they were part of a hind limb, and this information was retained when they later received the message that they were at the extremity of a limb!

A picture emerges of a morphological structure becoming ever more intricately organised by virtue of a *chain of command*, in which specific regions exert control by sending out messages, each at its appropriate time. In the early stages of development of a vertebrate, a linear formation called the *notochord* makes an appearance and takes control over the rest of the still relatively undifferentiated egg, imposing structure on it. It induces in its vicinity, along either side, rows of little cell condensations called *somites*. The somites and the limb-buds are active sites exerting secondary control; the somites induce the development of vertebrae and ribs, and the limb-buds grow outwards and become internally structured as the bony skeletons of the limbs begin to form from condensations of cells within the buds. It is a striking fact that the regeneration of lost limbs in salamanders is initiated by the *nerve cells* in the new limb-bud produced at the site of the injury; the nerve cells are, of course, extensions from the spinal column — the organ that began life as the notochord. And, of course, the *brain* of the animal is in a very obvious way the initiator of the messages that control behaviour; it begins life as one end of the notochord. In other words, the *same* structure, in all its phases (notochord — spinal column — central nervous system) seems to head the hierarchy of control throughout the life of the organism, from egg to mature adult.

In dicotyledonous plants, an analogous ‘control centre’ is the *apical meristem* — a small group of active cells at the growing tip of each shoot that initiates the formation of the leaf primordia in a temporally and spatially precise pattern around itself. It is therefore responsible for the morphological characteristics of the plant species.

The continuously-operating accurate control of growth rates and initiation of cell specialisations, and especially the precise timing of the *termination* of growth over a quite large region when a formation is fully developed, puts a severe strain on the hypothesis that *everything* about morphogenesis is brought about *only* by the action of DNA.⁵⁷ In particular, the range of forms in the bones of vertebrate skeletons is immense, and these forms are very precisely related to each other and to their structural ‘purpose’ in the adult animal. The achievement of

results like these by the co-ordinated action of a community of cells involves a fantastic dynamical network of information about continuously-changing, intricately structured formations. The idea that *all* this information is somehow encoded in the molecular structure of DNA — a molecular structure that is *known* to be ‘nothing but’ a list of specifications for protein molecules — and entirely a consequence *only* of that molecular structure, is not easy to maintain. It appears, the more you think about it, rather far-fetched.

Interlude

The knowledge of the world that science has acquired has given rise to an astonishing hypothesis⁵⁸: that life and consciousness have arisen from the blind, purposeless and mechanical action of matter; that the *only* reality is the reality of atoms and the local interactions determined by their chance encounters.

Scientific exploration bases itself on certain well-founded principles, principles whose purpose is to protect scientific knowledge from the intrusion of human irrationality.

An important principle of science concerns the role of hypotheses. A hypothesis is not a dogmatic belief to be fiercely clung to, defended and protected against the ‘heretical’ pronouncements of those who seek to contradict it. On the contrary, a hypothesis is a mental tool, a provisional framework of ideas that enables knowledge to be organised and new knowledge sought. The value of a hypothesis lies in the way it lends itself to testing against empirical observation. Popper⁵⁹ made the insightful suggestion that the value of a hypothesis lies in its openness to possible refutation. As we have seen, the supporting evidence for the ‘astonishing hypothesis’ seems, for many scientists, conclusive. In many minds, the hypothesis has become *irrefutable*: those who attempt to construct alternative hypotheses are seen as fools who don’t understand ‘science’ — the victims of obsolete animistic superstitions — and experimental results and observations that do not fit into the mechanistic scheme implied by the hypothesis are ignored.

This is not a rational attitude. It is irrational and *anti-scientific*.

We have examined some of the ideas of those who have made attempts to seek out alternative hypotheses that might lead to a richer and more profound understanding. These ideas are not fantasies, they have been arrived at from observations of the real world, observations that persistently and cumulatively intimate that the amazing organising, complexifying and exploratory behaviour that characterises biological

systems are *not* just arbitrary and incidental artifacts of chance, but rather manifestations of something built into the very fabric of reality. This amounts to a viable hypothesis, neither more nor less ‘astonishing’ than the materialist hypothesis, and equally worthy of serious attention. Indeed, the very fact that life and consciousness have arisen at all in an otherwise chaotic universe is very strongly in its favour.⁶⁰

It seems to me unlikely that the way Nature operates is bounded by the limits set by the human capacity to understand. Nevertheless, the human instinct of curiosity demands that we do what we can to understand as much as we can. The materialist hypothesis, in spite of its success in contributing to scientific knowledge, is limited by the habitual tendency to try to ‘explain’ everything in terms of elementary mechanical events and deterministic causality. It shows signs of rigidifying into a dogmatic belief impeding the investigation of (and even the recognition of) phenomena that lie outside its scope. Significant progress in understanding these phenomena will require more flexible ways of thinking and a greater open-mindedness.

So far, we have remained within the limits of ‘respectable’ scientific topics. Or, rather, we have been exploring the boundaries of respectable science, in an attempt to see where they need to be extended, and where conventional scientific opinion is open to doubt. We shall now continue our exploration outside the boundary, in the realm of so-called ‘paranormal’ phenomena. The light of rationality and scepticism will guide us — but we shall not permit it to blind us. The world of scientific knowledge and the oft-derided world outside its boundaries are in reality *one* world, the only one we can ever really know — the world of human conscious experience.

Notes and References

1. Wright, R., Science, God and man, *Time*, 4 Jan. 1993.
2. Lewin 1993; Poundstone 1985; Lewin, R., A simple matter of complexity, *New Scientist*, 5 Feb. 1994, p.37.
3. Schrödinger 1958.
4. Attenborough 1979, chapter 13.
5. Dawkins 1976. The chapter on ‘memes’ was republished in Hofstadter & Dennett (eds) 1982, p.124.
6. Driesch, H., *Zeitschr. f. Wiss. Zool.* 53, 1891, p.160; Driesch 1908, 1929; Needham 1936, 1968.
7. Pritchard, D.J., The missing chapter in evolution theory, *Biology* 37, 1990, p.149; Keeton 1976, p.745.
8. Koestler 1979.
9. Needham 1936, 1968.

10. The story is quite widespread. A variant of it, attributed to Sufi tradition, is given by Idries Shah 1964.
11. Needham 1936, 1968, p.78.
12. *ibid.*, p.78.
13. Skinner 1938: quoted by Koestler 1978.
14. Medawar 1984.
15. The brief account of the life and work of Kammerer that I have given is based on Koestler's fascinating book, *The Case of the Midwife Toad*, Koestler 1971.
16. Flammarion 1900; Koestler 1967, p.158; Koestler 1979, p.201; Watson 1988, p.9.
17. Maynard Smith, J., in Waddington (ed.) 1969, p.83. The identification of fitness with efficiency in leaving offspring is the dominant theme of Dawkins' *The Selfish Gene*, 1976. A curious phenomenon that would seem to refute it is the mechanism of population control in some bird species: when flocks become too large, a certain proportion of the population ceases to mate. The birds with this propensity to cease mating cannot, for obvious reasons, pass on the trait to future generations, so the fact that this survival tactic of the species exists and persists is at variance with neo-Darwinian explanatory principles. For an interesting discussion of this point see David Bohm's remarks in Waddington (ed.) 1969, p.106.
18. Simpson 1964.
19. Waddington, C.H., in Waddington (ed.) 1969, p.121.
20. Thompson 1961, chapter 8.
21. For some people these overwhelming improbabilities have the quality of seeming intuitively self-evident — for that reason, they *cannot* be convinced by neo-Darwinism. I have to confess that I am one of them, try as I might to be impartial and objective: my perception of neo-Darwinists is that they repress this intuition because *for them* the impossibility of any alternative kind of explanatory principle has the quality of seeming intuitively self-evident.
22. A component of evolution is the elimination of features that, through changing conditions, have lost their usefulness; meaningless characteristics degenerate. Obvious examples are the redundant toes of horses, the eyes and skin-patterns of certain newts and fishes whose ancestors took to living in the total darkness of caves, the legs of snakes and the tails of anthropoid apes. Neo-Darwinism has no way of accounting for this. Natural selection *alone* has no way of eliminating useless characteristics unless they have become positively detrimental to survival.
23. World Wide Fund for Nature, *Bionics: Nature's Patents*, Pro Futura Verlag, Munich 1994.
24. Paley, Wm., *Natural Theology*, London 1828. Paley's argument is the 'argument from design': if you found an intricate mechanism such as a watch lying on the ground, you would be forced to conclude that it had been made by an intelligent watchmaker. Similarly, the intricate mechanisms of living things

imply the existence of a Maker. Dawkins' clever title *The Blind Watchmaker* is, of course, an allusion to Paley's argument, identifying the 'Maker' with Chance.

25. The stability of some species is quite anomalous, and at variance with the notion that the mutations that drive the evolutionary process are entirely random changes affecting DNA indifferently wherever it occurs. Crocodiles arose during the Triassic period and have survived virtually unchanged. Among vertebrates, the champions in this game of *avoiding* evolution are the coelocanth, which remain unchanged after 400 million years, during which time the whole evolution of land animals, with its fantastic transformations and elaborations, took place. If mutations took place *randomly* the statistical improbability of these anomalous stabilities would be astronomical.
26. Kammerer, P., *New York Evening Post*, 23 Feb. 1924: quoted by Koestler 1971.
27. McDougall, W., Fourth report on a Lamarckian experiment, *British Journal of Psychology*, 28, 1938, p.321; Sheldrake 1981; Talbot 1988.
28. Sheldrake 1981; Talbot 1988.
29. Gardner, M., The EPR paradox and Rupert Sheldrake, *Skeptical Inquirer* 11, (no.2) 1986, p.128.
30. Bohm 1981.
31. Sheldrake 1981; Gordon 1992, p.325.
32. Watson 1979.
33. Attenborough 1979, p.282.
34. Sheldrake 1981; Talbot 1987; Gordon 1992, p.324; Amundson, R., *Skeptical Inquirer* 11 (no.3), 1987.
35. Holden, A. & Singer, P., *Crystals and Crystal Growing*, Heinemann, London 1961; Watson 1979; Sheldrake 1981, p.168; Talbot 1987, p.71; Watson 1988, p.63.
36. Varela, F.J. & Letelier, J.C., Morphic resonance and silicon chips: an experimental test of the hypothesis of formative causation, *Skeptical Inquirer* 12 (no.3), 1988, p.298.
37. Steinhardt, P.J. & Ostlund, S., *The Physics of Quasicrystals*, World Scientific, Singapore 1987.
38. Penrose 1990, p.565.
39. Bonner 1965; Bonner 1967; Talbot 1987, p.124; Watson 1988, p.43.
40. Gerisch, G., Chemotaxis in *Dictyostelium*, *Ann. Rev. Physiol.* 44, 1982, p.535.
41. Godfrey, S.S. & Sussman, S., the genetics of development in *Dictyostelium discoideum*, *Ann. Rev. Genet.* 16, 1982, p.385.
42. Marais 1937, 1974: quoted by Watson 1988, p.124.
43. *ibid.*
44. Moscona, A.A., Tissues from dissociated cells, *Scientific American* 200 (no.5), 1959, p.132; Keeton 1976, p.743.
45. Humphreys, T., Chemical dissolution and in vitro reconstitution of sponge cell adhesions, *Developmental Biology* 8, 1963, p.27; The experiment with

sponge cells was first carried out by H.G. Wilson in 1907. Later experiments showed that cells from two sponges belonging to different species, when mixed together, could recognise their own kind and sort themselves out.

46. Thompson 1917, 1961; see also Stevens 1976.
47. Schwenk 1965.
48. Clowes 1967. Though now quite old, this book remains one of the clearest general introductions to cell biochemistry and the genetic code.
49. Thompson 1961, chapter 9.
50. Waddington, C.H., Morphogenetic fields, *Sci. Progr.* 29, 1934, p.336; Lord, E.A. & Wilson, C.B., *The Mathematical Description of Shape and Form*, Ellis Horwood, Chichester 1986, p.71; Jacobson, A.G. & Gordon, R., Changes in the shape of the developing vertebrate nervous system analysed experimentally, mathematically and by computer simulation, *J.Exp. Biol.* 197, 1976, p.191; Oster, G.F. *et al.*, A model for chondrogenic condensations in the developing limb: the role of the extracellular matrix and cell traction, *J. Embriol. Exp. Morph.* 89, 1986, p.93.
51. Thom, René, *Structural Stability and Morphogenesis*, Benjamin, Reading Mass. 1975; Woodcock, A. & Davis, M., *Catastrophe Theory*, Penguin 1980, p.100; Zeeman, E.C., *Catastrophe Theory*, Addison-Wesley, Reading, Mass. 1977.
52. Wigner 1967, p.231.
53. Arbib, M.A., in Waddington (ed.) 1969.
54. Bohm, D., in Waddington (ed.) 1969, P.92.
55. *Timing* is obviously a major factor in the control of morphogenetic processes. A striking example of it is the development of the dermal condensations on the skin of a chick embryo, that become feathers. They develop successively, row by row, in a neat array, as if in response to a wave of some chemical initiator. However, if cultured strips of skin are separated even twenty-four hours before the condensations are due to appear, they duly appear on each strip at the pre-ordained time. The nature of the 'biological clock' in processes such as these is not known: Davidson, D., The mechanism of feather pattern development in the chick, *J. Embriol. Exp. Morph.* 74, 1983, p.245; *ibid.* p.261; Bard 1990, p.154.
56. Wolpert, L., Positional information and the spatial pattern of cellular differentiation, *J. Theoret. Biol.* 25, 1969, p.1.
57. Bard, 1990, p.262.
58. Crick 1994.
59. Popper 1959.
60. 'Nothing will come of nothing: speak again.' — *King Lear*.

10 PARAPSYCHOLOGY

The Status of Experimental Parapsychology

A priori beliefs say a great deal about the personal psychology of those who hold them. The trouble with strongly-held belief systems of any kind is that they engender a purblindness that gives rise to bias and selectivity in assessing evidence. The belief in materialistic reductionism is no exception.

We have examined the case for the mechanistic belief. We have examined the evidence for and against, and we have looked into the arguments of the defence and the prosecution. The verdict at this stage, I think, must be ‘not proven’.

An unbiased consideration of some of the major unsolved problems facing science seems to give the impression that the mechanistic paradigm is likely to turn out to be inadequate for a proper understanding of some of the subtleties of the natural world. This impression arises from the paradoxical nature of elementary physical law. It arises again in the life sciences when attempts are made to ‘explain’ evolution and morphogenesis on mechanistic principles. And it arises especially in connection with the nature of consciousness and the question of the relationship between conscious experience and ‘objective reality’.

Beginning with J.B. Rhine’s pioneering efforts in the 1930s, numerous laboratory experiments have been performed to investigate whether or not consciousness has access to information by means other than sensory perception. They constitute the field of experimental parapsychology.

If the existence of ‘extra-sensory perception’ (ESP) were to be established irrefutably by strictly scientific methods, in a manner totally convincing to the whole scientific community including its most sceptical members, the mechanistic world view would be dead. This has not happened. The history of parapsychology has turned out to be the history of an apparently interminable debate between ‘believers’ and ‘unbelievers’. Parapsychologists incline to the *a priori* belief that ESP is at least *possible* — no investigator would invest time and effort setting up and carrying out experiments unless he had some faith that what he was doing made sense! The ‘unbelievers’ — those sceptics with a strong conviction of the correctness of the mechanistic paradigm and hence of the impossibility of ESP — look for flaws in the

experiments of parapsychologists and attempt to debunk them. Since parapsychologists who have accepted results of experiments as evidence for ESP claim only that it is an elusive and weak phenomenon, spasmodic and not reliably reproducible, it is relatively easy for the ‘unbelievers’ (those that deign to consider the matter at all) to think up ‘debunking’ explanations to deny the evidence. Even the inevitable fact that parapsychologists believe in the possibility of ESP has frequently been claimed to be a flaw that ‘could’ give rise to subconscious manipulation of the experiments and the data. Cases of deliberate fraud or hoax have occasionally arisen; the hard-line sceptic regards this as sufficient reason for dismissing the whole field of parapsychology — a rather odd attitude in view of the fact that hoaxes and frauds are not unknown in other more well-established branches of science.¹

My own view is that the enormous number of instances of ‘spontaneous’ ESP, in the form of reports testifying to presently unexplainable *experiences* of people in real-life situations, is far more compelling than the evidence that experimental parapsychology has been able to come up with. Nevertheless, though no single experiment or series of experiments has provided evidence acceptable to hard-line scepticism, parapsychology has, over the years, accumulated a very substantial body of data that seems to imply the existence of ESP. One can either accept that reality and seek new explanatory principles, or one can hold on to the mechanistic world view and regard *all* the apparent evidence as an artifact of faulty experimental procedures.² Which of these alternatives appears more reasonable is entirely a matter of one’s personal psychological predispositions.

In the 1930s the behavioural psychologist Hans Eysenck commented on the accumulated results of experimental parapsychology:

Unless there is a gigantic conspiracy involving some thirty University departments all over the world, and several hundred highly respected scientists in various fields, many of them originally hostile to the claims of the psychical researchers, the only conclusion the unbiased observer can come to must be that there does exist a small number of people who obtain knowledge existing either in other people’s minds, or in the outer world, by means as yet unknown to science.

— *Hans Eysenck*³

Rhine's Experiments

A family was awakened late one night by a neighbour wanting to borrow a horse and buggy to drive nine miles to a neighbouring village. The man's wife had been awakened by a vivid dream in which she had seen her brother return home, unharness his horses, and then go up to his hay-loft and shoot himself with a pistol. She saw him pull the trigger and roll over in the hay, down a small incline into a corner. The horse and buggy were lent and they drove over to the brother's house. The brother's wife was there, waiting anxiously for her husband's return.

They went to the barn and found the horses unharnessed. They climbed to the hay-loft, and there found the body in the spot the sister had described in her dream. The pistol was lying in the hay where it would have fallen if it had been used as she had indicated and if the body had afterwards rolled down the incline. It seemed as though she had dreamed every detail with photographic exactness.⁴

This story is typical of many thousands that constitute the 'anecdotal' evidence for 'spontaneous' clairvoyance. It was told by a professor of botany to his students at the University of Chicago. The event had happened to his family and neighbours when he was a boy. The professor concluded by saying

I was only a boy at the time, but it made an impression on me I've never forgotten. I can't explain it and I've never met anyone else who can.

One of the professor's students was Joseph Banks Rhine, who later became a professor of psychology at Duke University. The story made a deep and lasting impression on him, too. It was clear to him that if the human mind does in fact sometimes acquire knowledge through other than ordinary sensory perception, then that would be something of enormous significance that should not be left out of our scientific understanding of the nature of reality. On the other hand, it seemed to him that the accumulated mass of anecdotal reports, however impressive, did not amount to respectable 'scientific' evidence. He therefore sought to establish the existence of ESP by means of controlled laboratory tests. This experimental work was begun at Duke University in 1930 and continued for several decades.

Rhine's methodology is extremely simple. The equipment is a pack of 25 cards, called 'Zener' cards, marked on one side with diagrams (star, circle, waves, cross and square) and the pack contains five cards of each kind. The pack is shuffled and the experimenter turns up one card at a time. The 'subject' is required to guess which kind of card is face down on top of the pack before it is turned up. When 25 guesses have been made the pack is used up; that constitutes a 'run'. Each individual guess is a 'trial'. During a run the subject is not allowed to see which cards have been turned up and is not told whether his guess was right or wrong at each trial. Obviously, under these circumstances there is a one in five chance of guessing correctly on each trial. It is possible to compute the probability that, if the average success rate is more than five correct guesses per run, this result is due only to chance.

The idea of using card-guessing as a test for the existence of ESP was suggested long before Rhine's famous experiments at Duke University. In the early seventeenth century Sir Francis Bacon, a thinker far ahead of his time and the first person to formulate clearly the principles of 'scientific method', suggested it as a way of testing people who claim to have 'second sight'. However, serious and concerted efforts in this direction began only in the 1930s, as a result of Rhine's pioneering efforts.

For the full details of Rhine's prolonged series of experiments the reader may like to consult his books and journal articles. Statistical analysis of the results showed that the likelihood that chance alone could be responsible for the consistently high scores is so *utterly* remote that it can be completely discounted. Rhine concluded that the operation of ESP underlying the guesses was conclusively established. Whether this ESP was clairvoyance, telepathy or precognition need not concern us; this kind of labelling of the alleged phenomenon is perhaps misleading anyway.

An astonishing event occurred between Rhine and one of his most spectacular 'high scorers', A.J. Linzmeyer. Rhine and Linzmeyer were out for a drive, for relaxation after the rather tedious experiments. It was the day before Linzmeyer was to leave Duke University to take up a job, and so the last day of his work with Rhine. They drew over to the side of the road and Rhine got out a pack of Zener cards. Linzmeyer leaned back with his head resting on the back of the seat. During the actual experiment, his eyes were closed.

After giving the cards a cut — neither of us knew the order of the cards anyway — I drew off the top one and tipped it

towards me just enough to catch a glimpse of the symbol and then put it face down on the notebook on Linzmeyer's lap. Without looking at it or touching it he said, after a pause of about two seconds, 'Circle'. 'Right', I told him, drew off the next card, and laid it on the notebook. 'Plus', he said. 'Right', 'Waves', 'Right', 'Waves', 'Right'. At this point I shuffled the pack again, cut it once more and again drew off a card. 'Star', Linzmeyer said. It was a star. When he had called *fifteen cards in succession* without a single mistake, both of us were too amazed for a while to go on with the rest of the run.

No conceivable deviation from probability, no 'streak of luck' which either of us had ever heard of could parallel such a sequence of unbroken hits...

Eventually we went on with the run... his total was 21 correct calls out of a possible 25.⁵

(Because the standard procedure was not followed in this run, Rhine excluded it from his analysis of the series of controlled laboratory experiments). The odds against guessing fifteen consecutive Zener cards correctly is *thirty thousand million* to one.

Another consistently high scorer was Hubert Pearce. 'Day in and day out for two years he could be relied on to average about ten correct guesses out of twenty-five.' Once, Rhine was alone in the laboratory at the end of the day when Pearce came by. Both men were in a more than usually relaxed and playful mood and decided to do a little more testing. Rhine adopted a variation of the usual routine. After each card was called and observed (presumably, Rhine means observed by both of them) it was returned to the pack and a cut made. After a few hits and misses, Pearce proceeded to make twenty-five correct guesses in succession. The odds against this happening by chance are three hundred thousand million million (3×10^{17}) to one.

The circumstances of Rhine's initial meeting with Pearce are perhaps not without significance, in view of the fact that Pearce turned out to be one of Rhine's most successful subjects. Pearce was a young divinity student in the audience when Rhine delivered a talk on parapsychology to the Theology department. He came up to Rhine after the talk, saying that he had been particularly interested because his mother had 'psychic abilities' and some unusual 'psychic' experiences had occurred in his family. When Rhine asked him if he himself possessed these psychic abilities, Pearce answered, "Yes, but I'm afraid of them."⁶

In the Duke University tests for ‘distant telepathy’ the ‘agent’ was J.G. Pratt (later to become a prominent ESP researcher) and the ‘percipient’ was Pearce. Rhine made two series of tests with the agent in the physics department and the percipient in the library building a hundred yards away. The procedure was for Pratt to look at each card for a minute while Pearce, with synchronised watch, recorded his guesses. After two or three runs each participant sealed his record in an envelope and delivered it to Rhine. In the first series 300 trials were made over a five-day period and Pearce made 119 correct guesses. In the second series Rhine himself was in the room with Pratt throughout, to guard against any possible later accusation that Pearce and Pratt might have been in collusion to deceive him. The score was 57 correct guesses out of 150. The probability that these results are due to chance is vanishingly small ($P < 10^{-17}$ in the first case and $P < 10^{-5}$ in the second case).

In a remarkable but brief series of trials, extending over three days, the agent (Miss Ownbey) and the percipient (Miss Turner) were 250 miles apart. 125 guesses were made, of which 51 were correct ($P < 10^{-8}$: odds against chance of a hundred million to one). As Rhine pointed out, the only ‘rational’ explanation — i.e. the only explanation not involving ESP — in this case would be ‘collusion between Miss Ownbey, my trusted experimental assistant for many years, and Miss Turner, whose reputation, too, is beyond reproach.’

The Refutations

This is something I wouldn’t believe even if it were true!

— *Anonymous*

In referring to Rhine’s work, a psychologist writing in the *American Journal of Science* asserted that ‘not a thousand experiments with ten million trials and by a hundred separate investigators’ would make him accept the existence of ESP. The leading behaviourist D.O. Hobbs rejected Rhine’s evidence for telepathy ‘because the idea does not make sense.’⁷

Isn’t there something familiar about this kind of stubborn incredulity? Isn’t it reminiscent of Deluc’s statement that he wouldn’t believe his eyes if he witnessed the fall of a meteorite?

The reactions I have cited are typical of much of the response to Rhine’s work and the work of other parapsychologists. The attitude they reveal is not worthy of a scientist, and does not merit attention.

But there have been more serious and thoughtful criticisms of Rhine's work, and attempts to refute his results, that deserve careful consideration. One of the most cogent and apparently convincing of these attempts came from Martin Gardner. Gardner's approach is honest and sincere:

Just as Rhine's own strong beliefs must be taken into account when you read his highly persuasive books, so also must my own prejudice be taken into account when you read what follows.

— *Martin Gardner*⁸

Gardner and other sceptical commentators regard as extremely suspicious the fact that experimenters who believe in ESP, like Rhine, obtain positive results from card-guessing experiments, while those who believe ESP to be impossible do not.⁹ Rhine's opinion on this is that the experimenter's mental attitude can have a marked influence on the very delicate and weak ESP phenomena that the experiments are designed to detect. This is not at all as implausible as detractors make it out to be: *if* ESP exists, then one would *expect* the whole psychological situation, including the rapport between investigator and subject, to enter into the processes giving rise to it. In other words, these experiments are not like physics experiments in which 'subjective' factors such as beliefs, attitudes and expectations are irrelevancies to be eliminated. In parapsychology the situation is not that simple. The hypothesis that ESP is real implies that 'subjective' factors are inextricable components of the effects that the investigator is trying to establish or refute. Therefore, unfortunately, one is not justified in demanding that parapsychology experiments comply with the usual 'scientific' requirement of reliable repeatability.

Rhine has been accused, by Gardner and others, of being non-rigorous and careless in his approach to experimentation — his experiments are said to be poorly planned and inadequately controlled. An unbiased reading of Rhine's books do reveal some justification for this criticism — he was a pioneer, learning as he went along with no precedents for guidance. It has also been alleged that Rhine's statistical analysis was tainted by naive selection of runs favourable to his belief in ESP. For this, I can see no justification whatsoever. On this point, Gardner quotes Mencken:

In plain language, Professor Rhine segregates all those persons who, in guessing the cards, enjoy noteworthy runs of luck, and

then adduces these noteworthy runs of luck as proof that they must possess mysterious powers.

— *H.L. Mencken*

This is a gross misrepresentation of Rhine's methodology. In a scientific experiments designed to detect a small and elusive effect that is likely to vary in strength from one individual to another, it is wholly reasonable and soundly scientific to carry out preliminary tests to select individuals in whom the effect seems stronger, and only then to proceed to the main experiment using the selected individuals. This is simply common sense, and is what Rhine did. In his own words, 'what we were interested in was not finding out whether *everybody* possesses extra-sensory perceptive powers, but whether *anybody* does.'

A related criticism is that Rhine 'explained away' unfavourable runs by attributing them to fatigue or boredom on the part of the subject. He did nothing of the sort. He simply pointed out an interesting and highly significant effect — a persistent pattern in the data. His subjects tended to begin with high scores and then to fall to chance levels of scoring after a long sequence of runs. There is no 'explaining away' in this observation — the runs belonging to the tail-end were not omitted from the statistical analysis. The 'tailing-off' was there in the data, and significant for the ESP hypothesis. If chance alone were operating, the tailing-off effect would have been absent. If ESP were also operating, one would expect it to deteriorate with loss of interest, just like performance at any other skill.

In discussing his results Rhine often draws attention to conspicuous examples of phenomenally high scoring — what Mencken called 'noteworthy runs of luck'. From Rhine's viewpoint, this is part of the legitimate observation of significant patterns in the data. Gardner sees it as selection of portions of the data that support Rhine's belief and points out that the laws of probability make it inevitable that 'noteworthy runs of luck' will arise if millions of guesses are made in the course of the experiments. To refute Gardner on this point is easy: one need only compute the actual odds against some of Rhine's extraordinary instances of high scoring. For example, Linzmeyer once made *nine consecutive* correct guesses. The odds against this happening by luck are two million to one — within the scope of Gardner's hypothesis. But then, *the following day*, Linzmeyer *again* made nine consecutive correct guesses! The day after that occurred the extraordinary happening I already mentioned, when Linzmeyer made *fifteen consecutive* correct guesses. Faced with this kind of data the suggestion that what is happening is a matter of 'luck' falls to the

ground — completely and utterly. In any case, a single statistic is sufficient to demolish any suspicion that luck, selection of data, or faulty use of statistics might account for Rhine's results: the first results published by Rhine contained a complete record of 85,000 trials, *including* the preliminary runs designed to eliminate subjects scoring at chance levels. The average number of correct guesses per run was seven. The odds against this are 10^{730} to one.

The conclusion that chance alone cannot account for Rhine's results is inescapable. But is the ESP hypothesis the only remaining possibility?

Gardner suggests that the subjects might be subliminally recognising the backs of the cards, after they have become marked or worn by repeated handling. Rhine was aware of this possibility:

Six or more packs of cards were kept at hand and the test pack changed frequently... We were careful not to allow an opportunity of studying the backs of the cards in order to prevent the possibility of any of the students with whom we were working being able to distinguish the cards by almost microscopic markings on their backs... as soon as the cards showed signs of wear and tear they were discarded.¹⁰

In any case, Rhine informs us that most subjects barely glanced at the cards while making their guesses; Linzmeyer liked to stand by the window and gaze out as he made his guesses. Significant above-chance scoring was obtained when subject and cards were in separate rooms, in one case 100 yards apart and in another, 250 yards.

Another hypothesis is the 'recording errors' hypothesis. In a long series of runs the recorder, being human, is liable to make mistakes. If the recorder believes strongly in ESP the mistakes tend to bias the data in favour of the ESP hypothesis. Gardner mentions 'an experiment at Stanford University' (no reference given) where the recording was done simultaneously by a believer in ESP and, unknown to him, by a tape recorder. Out of a thousand guesses, 46 failures were recorded by the human recorder as successes. Now this is thought-provoking, and if it had relevance to Rhine's recording methods it would indeed invalidate Rhine's data. The level of human error in this Stanford experiment is suspiciously high — it leads one to wonder if the human recorder was specially picked for carelessness and inability to concentrate! Similar experiments by Gardner Murphy and J.A. Greenwood ¹¹ showed mistakes made by human recorders at an

insignificantly low level — less than one mistake per thousand guesses. In any case, the Stanford experiment has *no relevance at all* to Rhine's actual recording method:

... the subject would name or call what he thought was the symbol on the top card. I would note down his call, remove the top card or let him do so, and we would repeat the procedure with the next card in the pack. Not until we had gone through the entire pack of 25 cards would I look to see whether the subject was calling the symbols correctly. Once we had run through the whole pack, the subjects calls, as noted down on my paper, were checked against the actual order of the cards.¹²

Clearly, biased recording mistakes arising from the recorder's belief in ESP are ruled out by this method. Only *random* recording errors can arise and these would have no tendency to produce spurious high scores. The only remaining way for biased human error to creep in is in the final comparison of the recorded calls with the cards in the pack. Pearce consistently scored an *average of ten* correct guesses out of 25, 'day in and day out for two years.' To account for this on the basis of human error when checking the calls against the cards in the pack, one would have to believe that *one in four* of Pearce's incorrect guesses were being mistaken for correct guesses!

When all else fails, the would-be refuters of Rhine's evidence for ESP (and that of other parapsychologists) can always take refuge in a final, unanswerable hypothesis: the accusation of fraud. Of course, it is *possible* to believe that Professor Rhine and his colleagues, and all other investigators who appear to have found evidence for ESP, have squandered years of their lives in the perpetration of an elaborate hoax, a web of lies, or in an extraordinary process of self-delusion. It is possible.

Why, sometimes I've believed in as many as six impossible things before breakfast.

— *The White Queen* ¹³

It might, though, be more plausible to accept that Rhine and other investigators *might* in fact have been detecting an effect for which we have at present no explanation. It *is* possible.

The Shackleton Experiments

S.G. Soal was a lecturer in mathematics who became interested in Rhine's work but was sceptical of the results. He carried out his own experiments with Zener cards, similar to Rhine's experiments, but obtained null results. However, when he re-examined his data on the hypothesis of *precognitive* ESP (specifically, comparing each guess with the *next* card that would come up) he found strong statistical support for the hypothesis. This precognitive effect has been found subsequently in the data of many other ESP experiments. Sceptics like to point out that if you keep trying different hypotheses and analysing the data in different ways, the laws of chance guarantee that you will find a statistically significant effect. That is true, but it cannot account for statistically *highly* significant effects, and is totally inadequate as an explanation of the persistence with which the precognitive effect reveals itself in many independent card-guessing experiments.

Between 1936 and 1943 Soal carried out an extensive series of telepathy tests with Basil Shackleton.¹⁴ Shackleton was not chosen by Soal but introduced himself, stating confidently that he had not come, not to 'be tested', but to *demonstrate* telepathy. Soal had the results of these experiments checked by eight independent witnesses. They showed quite remarkable above-chance success rates in card-guessing of precognitive type. This work was for many years highly regarded by parapsychologists.

Soal's records were deposited in the archives of the Society for Psychical Research. In 1978 Betty Markwick¹⁵ made an exhaustive study of this data, with the aid of computer analysis. She found that some of the lists of random numbers Soal had used in the tests had been used a second time, on a different occasion — sometimes with the order of digits reversed. It then became clear that the data had been manipulated; the duplicated sequences did not correspond exactly; *extra digits had been inserted, and these predominantly corresponded to 'correct guesses'*. Soal's experiments with Shackleton are, on this evidence, discredited.

A puzzling feature of this case is the difficulty of believing that a dedicated and respected research worker would devote years of his life to the production of fraudulent data, and *then* leave the incriminating documents for future investigators to study! Certain facts about Soal's personality suggest there may be something rather more complex operating here than deliberate conscious cheating. Long before the Shackleton experiments, Soal produced some quite remarkable and creative examples of automatic writing. He referred to

the secondary personality responsible for the automatism as ‘Mr. X’. Though this activity seems to have been discontinued before the Shackleton experiments began, it is not implausible to suppose that the fraudulent manipulation of the data was perpetuated by the repressed *alter ego* without Soal’s being consciously aware of it. Whatever the truth may be, Soal’s experiments are worthless as evidence for Shackleton’s alleged extra-sensory abilities.

In the next section we shall look at an attempt by a sceptic to discredit Soal’s work with Shackleton, that arose long before Markwick’s revelations. It is a fascinating exercise in ‘debunking’. In order to understand it we shall need to be clear about the details of Soal’s methodology. In each session Shackleton sat in one room while the transmitter or ‘agent’, and the experimenter — usually Soal himself — sat in another, out of Shackleton’s line of sight. In the early tests the door between the two rooms was kept closed, but later it was left slightly ajar to make it easier for the experimenter to hear when Shackleton had made a guess and was ready for the next. The agent sat at a table on which was a cardboard box and five cards each bearing a picture (elephant, giraffe, lion, pelican and zebra). Agent, box and cards were hidden from the experimenter by a plywood screen. The agent would shuffle the cards and lay them face down in a row inside the box. The experimenter was equipped with a list of random digits (1 to 5) and would show them to the agent one at a time through a three-inch hole in the screen. The agent would then turn up the card corresponding to the number and look at the picture on it. After fifty guesses the agent reshuffled, laid out the cards again, and the procedure would continue.

The scoring was far above the level of chance throughout the experiments, and appeared to be fairly conclusive evidence of precognition by Shackleton — he seemed to be successfully guessing not the current card, but the one that the agent would be looking at next. This continued throughout the seven years of the experiments. When the rate of guessing was increased, the success rate became high for precognition acting *two* cards ahead. The agents varied; the success rate was conspicuously higher when Shackleton was working with two particular agents. Incidentally, what strikes me as truly astonishing, if results like these were created *entirely* by manipulating the random numbers, is the sheer perverse ingenuity of the perpetrator!

‘Rational’ Explanations

Rawcliffe¹⁶ claimed that Soal’s experiments were evidence, not for extra-sensory perception, but for hyperacute sensory perception. He

drew attention to the phenomenon of ‘involuntary whispering’ — the intense verbal thinking of certain individuals is accompanied by slight involuntary movements of the tongue, lips and larynx, of which they are unaware. Moreover, auditory signals coming from this source can be picked up and interpreted by rare individuals with exceptional auditory discrimination. This remarkable phenomenon was established experimentally by Lehmann and Hansen, and by Sidgwick,¹⁷ and is well-known to ESP researchers as a possible source of spurious evidence for telepathy. Soal himself was well aware of the need to guard against it.

Rawcliffe discusses in detail the case of Ilga K., a nine-year-old mentally retarded girl, who was unable to learn to read. But when her mother or her teacher stood behind her, silently reading a book placed before Ilga, she was able to ‘read’ without difficulty any text, even one in a foreign language. Ilga’s abilities were attributed to telepathy until a thorough investigation revealed that her mother was an ‘involuntary whisperer’ and that Ilga’s powers of auditory discrimination were astounding. It seems likely that Ilga was autistic, a condition that is sometimes associated with astonishing ability in one particular skill. When the distance between Ilga and her mother was increased the mother’s involuntary articulations could be detected even by the investigators!

Rawcliffe constructs his explanation of Soal’s experimental results on the basis of these facts. The experimenter, while displaying a number to the agent through the hole in the screen, could have been looking at the next number on his list and articulating it involuntarily. The agent could then have picked up this signal subliminally and involuntarily articulated the name of the animal on the card associated with this number. Shackleton could then have detected this signal. On the basis of Ilga K.’s proven auditory hyperacuity, Rawcliffe is confident that Shackleton might have been able to do this even though the agent was in the next room, behind a screen and a partially-closed door. To support this suggestion, he informs us that Sidgwick’s experiments showed that a percipient could detect and interpret voluntary [*sic*] whispering with closed lips, inaudible to anyone else, at a distance ‘which varied but was ultimately extended to *eighteen inches* [*sic*], measured from the agent’s mouth to the percipient’s ear.’¹⁸ Rawcliffe’s explanations seem to me contrived and thoroughly implausible. They demonstrate how ‘rationality’ can be pushed beyond its limits by the will to debunk.

Rawcliffe offered the hypothesis of hyperacute sensory perception, auditory or visual, as a ‘rational explanation’ for most of

the ESP experiments that had been done up to the time he wrote his book. When these explanations did not apply for obvious reasons, he fell back on the accusation that the experimental controls were not adequate to totally rule out any possibility of fraud. He criticised Rhine severely for failing to appreciate the importance of ‘involuntary whispering’ as a possible source of spurious results in ESP tests, oblivious to the fact that in Rhine’s method the card to be guessed was not known to anybody — there was no-one to do the whispering. As for the tests in which Pratt and Pearce were in different buildings 100 yards apart, they are dismissed by Rawcliffe with the cryptic comment that they were ‘badly supervised’.

Rawcliffe tells us that the first Zener cards used in Rhine’s earliest work were too heavily printed, with the result that in certain lighting conditions and from a certain angle the symbols could be dimly discerned from the back, ‘as was subsequently shown’. Unfortunately, he does not tell us by whom it was shown, or the source of this information. But, armed with the information, he jumps to the conclusion that all of Rhine’s results throughout the many years of experiments at Duke University are invalidated. And he expects us to jump with him! The irrationality of Rawcliffe’s debunking methods — his underhand activity in manipulating his readers — is starkly revealed. What about Rhine’s casual remark that Linzmeyer liked to stand by the window and gaze out while making his guesses, or that Pearce did not even glance at the cards while guessing? In many experiments the cards and the subject were separated by a screen; in others, they were in different rooms. In the ‘down through’ tests the subject was required to guess the order of the cards in a whole pack as it lay undisturbed: Pearce was able to score at levels significantly above chance levels even on these tests — Rhine mentions the curious fact that Pearce’s success rate was higher for the cards near the top and bottom of the pack, in these tests.

The premise behind the extreme scepticism of ‘debunkers’ like Rawcliffe seems to be that once a ‘rational explanation’, however contrived, has been thought of, the alternative paranormal hypothesis is automatically invalidated. There is a curious logical flaw in this premise. Hypotheses are not *invalidated* by alternative hypotheses. Thus, for instance, Rawcliffe’s contrived ‘explanation’ of the Shackleton experiments demonstrates only that Soal’s paranormal hypothesis had not been incontrovertibly *proved* by the experiments. But that is in the very nature of scientific investigation: hypotheses are never incontrovertibly ‘proved’ by experiments. It is always, in science, a matter of assessing the relative plausibilities of competing

hypotheses, and that is a subjective judgment. The subjective judgment of the debunker is that the paranormal hypothesis is *inherently implausible, whatever* the experimental evidence. The accumulated body of statistical data from ESP experiments in which the results were positive is vast. It could be that some of these results were due to hyperacute hearing, others to hyperacute vision, others to recording errors, others to deliberate deception. But unless one has judged paranormal effects to be absurd *a priori*, this ‘explaining away’ exercise itself begins to look just a bit implausible. There is, after all, such a thing as cumulative evidence, and that is what the work of Rhine and of numerous other parapsychologists presents us with.

Electronics in Parapsychology

Several investigators have carried out their ESP tests, not with shuffled decks of cards, but with an electronic device for generating random numbers. Noteworthy experiments have been carried out by Helmut Schmidt¹⁹ of Durham, North Carolina. The core of Schmidt’s device was a piece of radioactive material, strontium 90. The time of decay of any particular atom in such a material is totally unpredictable, even in principle — it is a completely random event. Only statistical predictions for a large number of atoms are possible. A Geiger counter mounted next to the strontium 90 registered the arrival of electrons from the decays of individual atoms. The detection of an electron caused the stoppage of a high-frequency counter repeatedly generating the number sequence 1, 2, 3, 4. Thus, a digit was provided at random each time the counter stopped. This in turn determined which of a row of four bulbs would light up.

The subject to be tested is asked to guess which light bulb will be the next to come on and to record the guess by pressing one of four buttons. The next electron emitted after the button is pressed is the one that determines which bulb will in fact light up. All the recording was done electronically and stored on punched tape. No human recorder was involved.

The first experiment involved two subjects (a ‘spiritistic medium’ and ‘a truck driver and amateur psychic’) who had been selected on the basis of preliminary tests. Each made about 500 guesses and scored 7% higher than would be expected by chance ($P < 10^{-4}$: odds against chance of ten thousand to one). In the second experiment the subjects were the medium and the truck driver’s sixteen-year-old daughter. This time, a negative score was aimed for — that is, the subjects had to select a bulb that they guessed would *not* light up. They

obtained 9% fewer coincidences than would have been expected by chance ($P < 10^{-6}$: odds of a million to one!).²⁰

We seem to be faced here with either a weak precognitive phenomenon or with ‘psychokinesis’ — ‘mind’ influencing the radioactive decay process. However, this kind of terminology is perhaps misleading in the absence of any theoretical understanding of paranormal phenomena. At any rate, the experiments seem to imply that the mind of the subject and the apparatus together form a single system that is not strictly obeying either rigidly deterministic causality or the probabilistic rules of quantum mechanics.

In a later experiment²¹ the counter in Schmidt’s device was a random binary counter, and nine bulbs were arranged in a circle. The light would jump one step clockwise or anticlockwise at a rate of one jump per second, the direction determined randomly by the decay process. The subject was required to try to influence the light to move consistently clockwise by ‘willing’ it to do so. Two subjects, chosen for their previous consistently high scores in the four-bulb experiment (an ‘outgoing girl’ and a ‘quiet South-American ESP researcher’) each made 6400 ‘trials’ (50 runs of 120 jumps). For the girl the light showed an overall tendency to rotate *anticlockwise*. (Negative scoring has been observed occasionally in other ESP tests. When it is *persistent and cumulative* for a particular subject, as in this case, it is of course just as valid as positive scoring as evidence for a paranormal effect.) The effects were persistent and cumulative for both subjects throughout the experiments, each subject finally obtaining 360 more jumps in one direction than in the other direction ($P < 10^{-8}$).

On a cold day in 1970 Schmidt placed a heater in a shed, controlled by his random number generator. When a cat was in the shed the heater stayed on longer than one would have expected on the basis of probability. Whenever the cat was absent the device behaved normally. The odds against the effect being due to chance were sixty to one — significant but not spectacularly so.²² In a similar experiment Graham Watkins provided fifty lizards with a heater controlled by a random number generator like the one used by Schmidt. He found that the heater stayed on longer on cold days and stayed off longer on hot days. In trial runs with the lizards removed the random number generator behaved normally.²³

The most stringently controlled and technically sophisticated parapsychology experiments ever performed are those carried out by Robert Jahn of Princeton University. All recording and checking is done electronically. Jahn went to extreme lengths to eliminate any kind

of equipment failure that could possibly influence the results. Though the effect detected is extremely slight, statistically significant results have continued to accumulate over an extensive period. 'Sceptics invited to check his work first-hand seem to have left relatively impressed.'²⁴

Telepathy Experiments

The earliest recorded experiments to test the existence of telepathy were carried out in Liverpool in the 1880s by Malcolm Guthrie (a businessman), James Birchall (a headmaster) and two girls who worked in one of Guthrie's shops.²⁵ Later, they were joined by the physics professor Oliver Lodge. The girls were able to draw pictures closely resembling those drawn by the investigators, under controlled conditions that no sceptic has been able to find fault with. The drawings were simple arbitrary pictures and symbols. The resemblance between the 'sent' and 'received' pictures were consistently close when the girls were in the right mood, showing a keen interest in the 'game'. Many of the pairs are very strikingly similar.²⁶ The girls were less successful when they became bored and restless. To the embarrassment of Guthrie and Lodge, they were 'not in the mood' when Myers and Gurney of the Society for Psychical Research visited to test them. A different 'game' was tried — the girls were asked to guess what Myers or Gurney were *tasting*. One of the girls was consistently successful in this brief series of tests.

Upton Sinclair and his wife May carried out their own experiments in telepathic communication of drawings. May Sinclair had exhibited 'telepathic abilities' as a child. She would know instinctively when her mother wanted her and would return home in response to this instinct. The Sinclairs performed hundreds of tests, with Upton as agent and May as percipient. The results were quite spectacular.²⁷ May Sinclair's description of her state of mind when carrying out these experiments is of considerable interest:

First, she said, she needed to be in a state of concentration — not concentration on anything in particular, but simply in a high state of mental alertness. And at the same time she had to go into a state of complete relaxation. The relaxation would bring her into a state of *hovering on the verge of sleep*. And once she had achieved this state she was ready to begin telepathy.²⁸

That a relaxed and undistracted mental state is an essential prerequisite for the reception of extra-sensory perception is generally accepted by parapsychologists. Nineteenth-century investigators of hypnosis appear to have had considerable success with telepathy experiments.²⁹ For example, in 1885 the Russian hypnotist Pashkov claimed that he had been able to induce hypnotic trance states by telepathic command, in a patient 300 miles away. Similar experiments in France in the 1880s by the psychologists Pierre Janet and M. Gibert, in which the subject was the famous medium 'Leonie B.', were also reported to be highly successful. On several occasions in Le Havre in 1886 Gibert demonstrated that he could telepathically hypnotise Leonie at a distance of about two thirds of a mile — the experiments were observed and documented by Frederick Myers.³⁰ In view of reports like these it is rather surprising that in more recent years, except in Russia,³¹ parapsychologists seem to have shown little interest in exploring the possibility of employing the hypnotic trance state in ESP experiments.

Tests of the kind used by Guthrie and Lodge, and by the Sinclairs, have the defect that the results are not quantifiable. When comparing two drawings to assess their resemblance definite successes and failures are obvious, but the judgment of borderline cases is totally subjective. Telepathy experiments like those of Rhine solve this problem by restricting the pictures to a small range of standard symbols (such as the five Zener card symbols). But then another disadvantage arises — the 'game' rapidly becomes boring and most percipients' scores degenerate as they lose interest. In the experiments carried out in the 1970s by Thelma Moss,³² an assistant professor of medical psychology, and J.A. Gangerelli, a professor of psychology, the pictures used were chosen for intrinsic interest or emotional content. Prior to the experiment the percipients were classified as 'believers' and 'unbelievers'. In each 'trial' the agent would concentrate on a picture and the percipient, in a different room, would try to pick it out from a small selection of pictures. The experiments with percipients who believed in the possibility of telepathy produced high scoring rates with odds against chance of 3000 to 1. Unbelievers scored at chance levels. In a second series of similar tests with 22 agents in Los Angeles and 14 percipients in Sussex, significant above chance scoring rates were again achieved, the odds being again about 3000 to 1.

Perhaps the most remarkable series of telepathy tests on record is that carried out by Harold Sherman and Hubert Wilkins for five and a half months beginning on 25 October 1937. During this period the percipient Sherman — who had already been doing successful telepathy tests for several years with Mrs. Sherman and some close

friends — was in New York and the agent, Wilkins, was on an expedition in the Arctic, searching for lost Russian pilots.³³ They had arranged that Wilkins would spend a half-hour (11.30 to midnight Eastern Standard Time) on Mondays, Tuesdays and Thursdays, reliving and reviewing the events of the day. Sherman, in his study in New York, recorded his impressions in these periods. Sherman described his technique as one of ‘relaxed concentration’ and noted that

... once these mental images or feelings appear, they must be put into words and written down or spoken before the conscious mind can begin to cast doubt on their authenticity.

Here is a typical sample of Sherman’s notes, with Wilkins’ diary entries for the same day (21 February 1938):

Installing of engine has been completed and testing of it carried on today. Very difficult job — feel that weather delayed your work...[Cold south wind made for delay]. Someone of crew seems to have hurt left leg — someone else has skinned hand or finger...[Dyne had hands spotted with frost burns which blister... skin is pulled off when the hand is pulled away after being frozen to metal]. Use made of part of damaged engine — see someone tinkering with it — removing some parts...[Parts of old engine fitted to new]. You have some wine with friends who welcome you back to Aklavik...[They have had some liquor that I brought with me. I didn’t have any]. You brought back to Aklavik several boxes of cigars, cartons of cigarettes...[One box of one hundred cigars for Wilson]. Someone had toothache... [I had tooth filled evening before I left Edmonton. Was still tender and jumped each time I trod heavily].³⁴

When the experiment was concluded the hundreds of impressions recorded by Sherman were compared with Wilkins’ diary and log. ‘Seventy-five per cent were found to be correct.’

The Ganzfeld Technique

Higher scoring rates in telepathy experiments have been reported when the ‘Ganzfeld’ technique has been used.³⁵ In these experiments the percipient is isolated from sensory distraction by a uniformly-illuminated visual field and a background of white noise. This sensory

deprivation produces relaxation and peacefulness in the percipient, who is asked to describe the picture the agent, located in another room, is looking at. Experiments of this kind were begun in 1973 by Charles Honorton and S. Harper, at the Maimonides Medical Center in New York, and later at the Psychological Research Laboratories in Princeton. Other researchers throughout the world have adopted the technique, using various target materials such as numbers or music as well as pictures. The overall success rates have been remarkably high.

Any experiments that attempt to provide evidence for paranormal phenomena need to be conducted in such a way as to scrupulously rule out any possible suspicion of fraud or deception, if they are to gain general acceptance by the scientific community. This point is well illustrated by the doubt that has been cast on the Ganzfeld work of Carl Sargent of Cambridge University.

Susan Blackmore, a parapsychologist at Bristol University who had failed to get significant results from her own Ganzfeld experiments, visited Sargent's laboratory for eight days in 1979. She noticed flaws and carelessness in Sargent's methodology and wrote a report for the Society for Psychical Research — which, for reasons that are not clear, was not published until 1987.³⁶ In this report, Sargent was accused of deliberate deception.

In Sargent's experiments there were 27 sets of four pictures. A set of four was randomly selected and one of the four pictures, again randomly-selected, was presented to the agent. After each trial the experimenter and the percipient together look at a duplicate set of the four pictures and judge which of the four most nearly corresponds to the impressions the percipient had dictated while under the Ganzfeld conditions. Blackmore claimed to find bias in the pile of envelopes containing the letters A to D, used in the randomising process, and found spare envelopes around the room — circumstances that would arise if deception were being perpetrated:

I had predicted that certain methods of cheating would lead to bias in the main pile. I found that bias.³⁷

Blackmore also reports that in one trial Sargent himself did the randomising and then after the trial came in during the judging and *seemed to influence the percipient in making the correct choice*. There is something very mysterious here. Fraud and charlatanry are credible phenomena, but an otherwise intelligent person engaging in fraudulent activity *openly and stupidly while under observation* is not so easy to understand.³⁸ As Sargent remarked in self-defence,

I don't care whether people think I'm a fraud or not, but object very strongly to anyone believing I might be a stupid one... She merely capitalised on random and trivial errors and built a fairy tale around them.³⁹

Sargent's methodology seems flawed to me because of the unnecessarily clumsy elaborateness of the procedure for randomising the pictures. And *why on earth* should the percipient not decide for himself or herself which of four pictures most nearly resemble his or her own mental impressions without 'help' from anyone else? In a field where one is faced constantly by scepticism and has to be constantly on guard against suspicion of fraud, clarity and simplicity of method are essential. Too many parapsychologists don't seem to have understood this.

Mind Reach

In the 1970s Harold Puthoff and Russell Targ⁴⁰ of the Stanford Research Institute in California ran an extensive and ostensibly meticulously-controlled series of tests for what they called 'remote viewing'. The results were astonishing. In these experiments, target locations within a half-hour's drive from the Institute were chosen and the information put into sealed envelopes. The envelopes were randomly arranged and kept in a safe. In each test, an investigator and a 'percipient' were put into a double-walled copper-lined room that excluded all external sensory clues and radio signals. A team of experimenters would then choose an envelope at random, open it, and proceed to the specified location. After giving them sufficient time to arrive the percipient would then attempt to visualise the scene, making sketches and recording impressions on a tape recorder. Later, success or failure would be decided by independent assessors who matched the percipient's description to a list of possible locations.

Very many consistently highly-successful percipients were found. The most spectacular performance was that of a police commissioner who, before the experiments began, claimed to have 'psychic' ability. An instance of the commissioner's performance: he described a jetty and a lot of small sailing ships and an impression of oriental architecture, 'a Chinese or Japanese pagoda effect' — the two experimenters had travelled to a Chinese restaurant located on the dock. Very often, he was able to identify the target location by name, from his familiarity with the town and its environs.

Some percipients tended to describe scenes from a vantage point high overhead as if they were 'seeing' an aerial photograph rather than the view perceived by the experimenters. The implication seems to be that 'clairvoyance' rather than — or as well as — telepathy was operating.

In a later series of tests⁴¹ percipients were required to record their impressions before the experimenters arrived at the location, and *before the location had even been decided by randomly selecting an envelope*. The intention was to test for the existence of precognition. High success rates were obtained even in *these* tests. A startling example is the following. The percipient described a "quick flash of a black pointed area like the head of an arrow. He walks into it. It's like a triangle he walks into." He then got an impression of "a rhythmic kind of squeaking like a rusty pump, or not very well-oiled piston. Just a very rhythmic squeaking." Half an hour later an envelope was opened and the experimenter, who was already aimlessly driving around waiting for the radio message to tell him where to proceed to, was informed of the target location. On arrival he found himself in a small park containing a child's swing suspended from a black triangular frame. It produced a rusty, rhythmical squeaking when he sat on it to pass the time, and started to swing.

Since Puthoff and Targ did these remote viewing experiments dozens of similar investigations have given similar significant results. The United States Ministry of Defence became interested when it was realised that fairly accurate sketch maps of military installations could be produced by 'remote viewing'.

Reasons for Disbelief

The sceptical literature contains some highly persuasive arguments, explaining why the existence of any kind of extra-sensory perception is very unlikely. The psycho-neural identity (PNI) hypothesis seems to be strongly supported by evidence from neurophysiology. Beyerstein considers the split-brain phenomenon to be very strong evidence for PNI and against the existence of ESP:

Compelling support for PNI is found when brain tracts connecting the left and right hemispheres are severed to alleviate seizures. If information is presented uniquely to one hemisphere in these 'split brain' patients, the other hemisphere is unaware of it and unable to comprehend the informed side's reactions. Two mental systems, each with independent

memories, percepts and desires, co-exist in one body and are able to initiate (with no sense of conflict) mutually contradictory actions with opposite hands.

If consciousness is not tied to brain function, it is difficult to understand how interrupting nerve tracts could compartmentalise it. If 'free-floating' mind exists, why can't it maintain unity of consciousness by providing an information conduit between disconnected hemispheres? Parapsychologists claim that a mind can span continents to communicate with other minds; why is it patently unable to jump a few millimeters of uncoupled neural tissue?

Similarly, after brain damage, why is an allegedly separate mind unable to compensate for lost faculties when brain cells die? Having observed the devastation of brain injuries, it seems to me a cruel joke to suggest that only the input-output channels of a still intact mind have been damaged. The fortunate few who recover from reversible brain syndromes certainly recall no such serene redoubt.

— *B.L. Beyerstein* ⁴²

The above argument appears to involve the erroneous assumption that there is an opposition between two mutually contradictory hypotheses, with no third alternative: *either* mind is 'nothing but' brain physiology *or* it is completely independent of the brain. I am not aware that any parapsychologist has ever wanted to claim that mind and consciousness are 'free-floating' entities completely independent of brain function! Parapsychologists claim only that there is a mysterious brain function that gives the brain access to information through other than sensory channels. Beyerstein's argument is open to challenge by considering a simple analogy. Today a vast network exists whereby individual computers can exchange information by the telephone system. On this crude analogy each computer represents an individual human brain and the telephone system represents the mysterious process that must be inferred to exist if telepathic communication is accepted as a reality. (I emphasise that this is a *crude analogy*, not a model or theory of telepathy!) The analogue of Beyerstein's question is then: if you damage a computer, rendering it defective, why can't you use the telephone system to get it to function normally? Isn't it obvious that you can't?

Incidentally, I am not aware that any of the split-brain patients have been people claiming to have 'paranormal abilities'. It could be that, were a 'gifted psychic' ever unfortunate enough to have to

undergo this drastic surgery, some telepathic communication between the hemispheres might be detectable.

Implications

Science is about observing patterns in the behaviour of phenomena and trying to explain or understand them; it is not about converting people to a belief. Experimental parapsychology will continue to be open to ridicule and sceptical dismissal as a 'pseudoscience' so long as 'convincing unbelievers' is perceived as its principal aim. Accumulating statistical 'evidence' can never convince those whose unbelief is rooted in an intuitively-felt conviction that what they are being asked to believe is, on *a priori* grounds, nonsense. The situation will not change by doggedly pursuing the illusory goal of utterly foolproof, reliably-repeatable, laboratory tests for the existence of processes, while those processes remain apparently outside the scope of rational understanding and apparently in conflict with scientific explanatory principles.

Change in the status of parapsychology can only come about from the development of a successful *theoretical parapsychology* that would resolve the perceived conflict between established science and the evidence of experimental parapsychology. That is a tall order — it would require a radically expanded view of the way the world we experience produces its phenomena — but the *possibility* of such a development cannot be rejected on any rational grounds.

As we have seen, the extreme sceptical attitude that takes the impossibility of paranormal processes for granted arises from the intuitive belief, often not explicitly recognised, that *reality is a mechanism*. How does this belief arise? It is implanted and strengthened by our ordinary everyday experience of inanimate objects. We observe chains of cause and effect proceeding through time in an orderly manner, by the direct *contact* of material objects, as when a falling glass shatters on contact with the floor, or when a billiard ball starts to move as the cue strikes it and a second ball starts to move when the first one hits it, and so on. Physical science progressed by extracting the precise mathematical laws underlying this mechanical cause-and-effect, and extending the idea of cause-and-effect-through-contact to 'non-material' entities such as light and gravitational fields. As we have seen, the *universal* validity of this mechanical picture is open to doubts, and the doubts are not raised *only* by parapsychologists.

Scientific knowledge is, of course, an outcome of the way human beings consciously experience the world. The reason for the

existence of this thing, this ‘conscious experience’, is mysterious, and might be an instance of the kind of question science cannot answer — the valiant attempts of the believers in the strong AI hypothesis notwithstanding. Conscious experience embraces a wider range of phenomena than those that science has traditionally paid attention to. Experimental parapsychology did not arise spontaneously out of a perverse desire to oppose rational scientific principles. On the contrary, it was a response to a wide range of so-called ‘paranormal’ experience that seemed to elude rational understanding, and was motivated by the need to give ‘scientific respectability’ to this kind of human experience with a view to gaining a better understanding of it.

There are innumerable instances of human experiences that, if taken at their face value, imply the existence of mental processes such as telepathy, clairvoyance and precognition, that are not amenable to ‘normal’ modes of scientific explanation. The sceptical objection is that the anecdotal reports of these experiences are not acceptable as real evidence — that human testimony can never be absolutely relied upon, it is always open to doubt. The sceptical view is that explanation in terms of coincidence, misperception, exaggerated reporting or outright deception is *always* more plausible than belief in the reality of processes that defy ‘normal’ principles of rational understanding. Recognising this situation, Rhine hoped that the existence of ESP might be scientifically validated by detecting its operation under controlled laboratory conditions. This hope has not been realised; Rhine had underestimated the strength of sceptical unbelief. Experimental investigation is a human activity and therefore not infallible; laboratory reports are items of human testimony no less than are ‘anecdotal’ reports of ‘incredible’ events. They are no less open to sceptical opposition.

Notes and References

1. Broad & Wade 1982; Wilson 1978, part 2 chapter 1, p.179; Time, 1 Apr. 1991, p.37; Marsa, L., Scientific Fraud, Omni, Jun. 1992, p.32; Medawar 1966.
2. Alcock has suggested that any and all results that ‘strain credulity’ are to be accommodated by what he calls the ‘artifact hypothesis’. This ‘hypothesis’ amounts to dismissing all experimental evidence for ESP by claiming that some ‘normal’ explanation must be responsible for the results, even when no such explanation can be imagined: Alcock, J.E., Parapsychology’s past eight years: a lack of progress report, Skeptical Inquirer 8 (no.4), 1984, p.312.
3. Eysenck 1957: quoted by Koestler 1972, p.14
4. Rhine 1937, p.14.
5. *ibid.*, p.63

6. *ibid.*, p.72.
7. Koestler 1972, p.19.
8. Gardner 1952.
9. 'A basic requirement of science is that a demonstration of some new process should rarely fail when other investigators try to verify it. This requirement has not been met in parapsychology. Hence some conclusions can be drawn.' – Hansel, C.E.M., The evidence for ESP: a critique, *Skeptical Inquirer* 8 (no.4), 1984, p.322. [Why should a natural process comply with 'a basic requirement of science'?]
10. Rhine 1937, p.59. See also *ibid.* chapter 8.
11. Murphy, G., On the limits of recording errors, *J. Parapsychol.* 2, 1938, p.267; Greenwood, J.A., Analysis of a large chance control series of ESP data, *J. Parapsychol.* 2, 1938, p.138.
12. Rhine 1937, p.50.
13. Lewis Carroll, *Through the Looking-Glass*.
14. Soal, S.G. & Goldney, K.M., Experiments in precognitive telepathy, *Proc. Soc. Psychical Research* 46, 1943, p.21; Soal & Bateman 1954; McCreery 1967; Inglis 1985.
15. Markwick, Betty, The Soal-Goldney experiments with Basil Shackleton: New evidence of data manipulation, *Proc. Soc. Psychical Research* 56 (1978) pp.250-281.
16. Rawcliffe 1952.
17. Sidgwick, H., Involuntary whispering, *Proc. Soc. Psychical Research*, 1897, p.298.
18. *ibid.*: quoted by Rawcliffe 1952, p.406.
19. Schmidt, H., Instrumentation in the parapsychology laboratory: in Beloff (ed.) 1974, p.13; Randall 1975.
20. Schmidt, H., Quantum processes predicted? *New Scientist*, 16 Oct. 1969, p.114.
21. Schmidt, H., Mental influence on random events, *New Scientist*, 24 Jun. 1971, p.757; Schmidt, H., A PK test with electronic equipment, *J. Parapsychol.* 34, 1970, p.175.
22. Schmidt, H., PK experiments with animals as subjects, *J. Parapsychol.* 34, 1970, p.255.
23. Watkins, G., PK in the lizard (*Anolis sagrei*), *J. Parapsychol.* 35, 1971, p.281.
24. McCrone, J., Psychic powers: What are the odds? *New Scientist*, 26 Nov. 1994, p.34; Jahn, R.G. *et al.*, Correlations of random binary sequences with pre-stated operator intention: A review of a 12-year program, *J. Scientific Exploration* 11, 1997, p.345.
25. Swann 1987; Koestler 1972; Guthrie, M. & Birchall, J., *Proc. Soc. Psychical Research* 1, 1883, p.263; 2, 1884, p.24; 3, 1885, p.424; Lodge, O., *Proc. Soc. Psychical Research* 2, 1884, p.189.
26. Koestler 1972, p.31; Inglis 1985; Swann 1987.
27. Sinclair 1930; Swann 1987; Wilson 1988.

28. Wilson 1988, p.179.
29. Spence 1920, 1988, p.216; Guiley 1991, p.606.
30. Guiley 1991, p.606.
31. Ostrander & Schroeder 1961, 1973; Hardy, Harvey & Koestler 1973, p.112.
32. Moss 1974, 1976; Holzer 1969; Hardy, Harvey & Koestler 1973, p.113.
33. Sherman 1969; Sherman & Wilkins 1942, 1957.
34. Sherman 1969, p.20.
35. York 1976; Wolman (ed.) 1977; Pedlar 1981; Honorton & Rogo 1987; Guiley 1991; Hyman, R., J. Parapsychol. 49, 1985, p.3.
36. Blackmore, S., A report of a visit to Carl Sargent's laboratory, J. Soc. Psychical Research 54, 1987, p.186; Sargent, C., Sceptical fairytales from Bristol, J. Soc. Psychical Research 54, 1987, p.199.
37. Notice the false syllogism here: A implies B ; B ; therefore A.
38. It is, in fact, implausible. It is more plausible to suppose that Sargent did not in fact know the correct answer, but persuaded the percipient on the basis of his judgement of the dictated description, foolishly not realising how Blackmore might misinterpret his action.
39. Frazier, K., Row over Sargent's psi experiments erupts with evidence of carelessness and fraud, Skeptical Inquirer 12 (no.3), 1988, p.226.
40. Targ & Puthoff 1977; Mark, D.E., Remote viewing revisited, Skeptical Inquirer 6 (no.4), 1982.
41. Targ & Harari 1987; Rogo 1987; Guiley 1991.
42. Beyerstein, B.L., The brain and consciousness; implications for psi phenomena, Skeptical Inquirer 12 (no.2), 1987, p.163.

11 THE VARIETIES OF PARANORMAL EXPERIENCE

The Nature of the Evidence

Experimental parapsychology is an attempt to apply scientific methods to the detection, under controlled laboratory conditions, of strange and apparently inexplicable phenomena the evidence for which had hitherto consisted of ‘unscientific’ reports.

As we have seen, experimental parapsychology has failed, in the eyes of the majority of scientists, to establish itself as a genuine science. The most extreme form of scepticism is the view that what does not fit the pattern of the familiar, the known and the well-understood lies, *ipso facto*, outside the realm of the possible. According to this view all parapsychologists are either charlatans or incompetents.¹ Is such a view supportable on the basis of *rational* sceptical outlook, or is it merely unfounded cynicism? It *could* be that all parapsychological experiments that have produced positive results are ‘explained’ as the products of charlatanry and incompetence, but that would be exceedingly strange — as strange, perhaps, as the phenomena that parapsychology claims to have detected.

In attempting laboratory verification, parapsychologists are hampered by not knowing the conditions under which the effects they are trying to establish can and cannot arise. They recognise that these conditions are psychological conditions, but the particular psychological characteristics of the rare individuals that turn out to be ‘good subjects’ are not known, and the mental states in which ESP is possible (if it is possible!) are also unknown. The experiments thus differ radically from experiments in the physical sciences in that the ‘right’ conditions consist of unknown psychological factors, so that a requirement that is deemed to be a *sine qua non* of genuine scientific endeavour, namely the *reliable repeatability of experiments*, cannot be met.

The reports of strange experiences that motivated the search for laboratory verification of ESP constitute an enormous body of literature. There is no shortage of evidence indicative of a realm of experiential phenomena that is not at all understood. On the contrary, the sheer amount of data in the form of descriptions of paranormal experiences, that has accumulated and that continues to accumulate, is

one of the difficulties one faces in trying to assess it and seek explanatory principles that might account for it.

The pronouncements of sceptics to the effect that there is 'not a scrap of real evidence' for paranormal experience arises either from genuine ignorance — the consequence of an unwillingness to look into the matter because it is obvious *a priori* that it is all nonsense — or from an excessively narrow view of what constitutes 'real' evidence. The implication is that the evidence is untrustworthy and therefore to be dismissed *in toto* because it is 'anecdotal'. Anecdotal evidence is evidence in the form of reports claiming that something or other happened; it is unverifiable because we cannot go back to check. Scientific methods are ill-equipped to cope with this kind of data. Historians, on the other hand, deal with this kind of evidence all the time, yet history is not subjected to wholesale sceptical opposition, because historical evidence fits together and builds up a consistent picture of past events. Doubts and controversies arise in historical scholarship but, on the whole, items of historical documentation are mutually corroborative. The evidence for paranormal experience is worthy of serious attention *for the same reasons*. When it is studied with an open mind, consistent patterns become discernible. The same kind of paranormal phenomena crop up again and again. In many instances the authenticity of paranormal events is supported by the corroborative statements of multiple witnesses.

I have emphasised that what we shall be looking at in this chapter is paranormal *experience*. Subjective — i.e. psychical — phenomena are the fundamentals of all knowable reality. The self-appointed task of science is to render them intelligible. I do not think there is any room for doubt that paranormal experiences are *real*, in the sense that they are real subjective experiences.

Many of the instances seem 'incredible'. I am concerned only to present a selection of the data to try to convey something of its scope and variety. I am not concerned with the question of credibility versus incredibility — a question that deals only in terms of preconceptions that might well be misconceptions. The twin traps of gullibility and blind incredulity have for far too long hampered the search for truth in this area. Accordingly, I adopt and advocate the deliberate strategy of reserving judgment, presenting the material in a straightforward way without the tediously repetitive use of words like 'seemingly', 'apparently' and the cynical 'allegedly'. If the mechanistic picture of reality and in particular the mechanistic picture of brain and mind are correct, then the significance of the data of paranormal experience would lie only in what we can learn from them about brain mechanisms

and the nature of delusion and misperception.² On the other hand, they may imply the need for a radical revision of currently prevalent ideas about the nature of reality, of the kind that seems to be already hinted at by some of the anomalies and inconsistencies at the boundaries of scientific knowledge. Wherever the truth lies, reports of paranormal experience have something important to tell us, which will be revealed only if we pay serious attention to the reports and allow ourselves to be guided by a genuine unbiased wish to understand.

The selection of instances of the paranormal given here is, inevitably, highly personal. I have tried to seek out typical or representative examples of the various kinds of paranormal experience. Wherever possible I have sought well-authenticated and well-corroborated reports, but make no claim that a high degree of authenticity is attached to every piece of evidence cited. For obvious practical reasons I have concentrated on instances of paranormal experience that can be adequately conveyed in brief descriptions.

For section headings I have employed conventional terminology. No rigorous classification of paranormal phenomena is to be imputed to the use of words like 'clairvoyance', 'precognition' and so on. The various 'types' of phenomena overlap, and any attempt at genuine classification of the paranormal into different kinds of phenomena would be premature and misleading. I employ the commonly accepted terminology simply as a handy way of dividing up the chapter.

Clairvoyance

Certain individuals experience spontaneous flashes of clairvoyance fairly often. The well-known 'psychic' Harold Sherman received many letters from such individuals. One correspondent described in a letter to Sherman an event that occurred a few minutes after her husband had left the house to go to the store:

... After a while, our little girl went out to play. Now, our living room is so arranged that when anyone is seated toward the back of the room it is impossible to see the driveway. Moreover, we have always had heavy draperies across the front window. I was sitting in a chair in the back of the room, talking to my son, when suddenly I saw a clear image of the little girl standing behind our station wagon, and my husband about to remove his foot from the brake. The vision was so

compelling, and I was so certain that it was accurate, I leaped out of the chair and ran out of the front door. There my husband sat, in the car with the engine running, about to back out of the driveway. I screamed to him to wait, and sure enough, when I got to a point where I could see behind the car (she was too small to be seen through the windows), there she stood! My husband was pale and visibly shaken, but he had only one question: "How did you know?" My son repeated the question when he came to see what had sent me out of the house in such terror.³

As Sherman points out, 'that is the type of case that has been repeated, in one way or another, countless times. The archives of all psychic research laboratories and foundations are filled with them.' Sherman's correspondent concluded her letter with the following significant remarks:

All the instances I have related to you seem to bear out your contention, Mr. Sherman, that 'anxiety or feeling plays a large part in causing psychic phenomena.' I now recognise a genuine experience because of this one I have reported, when the feeling of certainty was so overwhelming as to leave a strong conviction of what was actually happening.

The enormous difference in quality and power, between spontaneous ESP and the feeble phenomenon tested in the laboratories of parapsychologists, the existence of which is deduced only from statistical analysis, is very striking. A reason for this difference is not hard to see. Naturally-occurring spontaneous cases of ESP like the one described above are an intimate part of the emotional life of the percipient, sometimes intervening in urgent life-or-death situations. The psychological conditions are far removed from those of the boring card-guessing games typical of experimental parapsychology.

Harold Sherman himself was able on many occasions to give information, obtained by 'clairvoyance', leading to the location of missing persons. As an example, I quote from a letter to Sherman from 'Diving Associates', an organisation in Arkansas specialising in underwater salvage operations:

17 Feb. 1966... I reported to you that bloodhounds had been used in searching for the child in the woods and that divers were also searching in the lake for the body. You advised that

you did not feel that the child was lost in the woods but that he had been drowned and his body would be found in the water at a location which you described as follows:

Two hundred feet to the right from the spot where the child was last seen, there is an obstruction; from this point a tree-surrounded path leads to a steep bank; twenty to thirty feet from the steep bank and in the water about twenty feet in depth is the location of the child's body.

I would like to advise that the child's body was found Tuesday afternoon in the exact location you described to me as noted above...

— *(signed) Carl E. Brooks* ⁴

Sherman describes the mental impressions that came to him when he first received the phone call in which he was told about the missing boy:

My attention became fixed on the boy, and I felt myself to be in the yard where he had been playing. I moved with him to the right, as reported over the phone to Mr. Brooks, and 'saw' the boy, in my mind's eye, encounter a low obstruction (which proved to have been a fence surrounding the property). He had reached the fence after traversing a tree-lined path, and somehow managed to clamber over it. I suddenly felt as though I were the little boy, as I continued on to the steep bank and toppled from it, into the water. I felt myself cry out and my mouth fill with water. I struggled briefly as the water closed over my head and I felt my body being carried out away from the shore, perhaps some twenty to thirty feet, where I sank slowly to the bottom of the lake. It was here that my mind disengaged itself from attachment to the boy's body, and I left it, as I mentally saw it huddled on the bottom in some twenty feet of water.

— *Harold Sherman* ⁵

There is some evidence that clairvoyance can be induced by certain substances that produce altered states of consciousness. In the following account of an experiment, a young engineer had taken three grains of peyote. Unlike some other substances that affect brain function, peyote does not impair the subject's ability to describe his experiences cogently, as they occur. A woman — 'Mrs. von S.' — who was present suggested that he attempt to see a picture book she had

given to her cousin two hours earlier; the cousin was a young mother who was ill and supposedly in bed at the time of the experiment. The engineer 'saw' an empty, neatly made bed, but not the young mother, and neither the child nor the book. However, he saw a bottle of perfume that the husband of the young woman had brought as a small surprise, just as Mrs. von S. was leaving. The investigator remarks further:

In this complex but clear clairvoyant experience, everything was correct, as I later verified. Against all expectations, the mother had left the room at the time of the attempt, and had taken the child and the book with her. We had great trouble making the sick woman and her nurse admit to her transgression of the doctor's orders. Both lied, and at length the nurse believed a servant had told us.⁶

This is one of several experiments with peyote, carried out by the pharmacologist Rouhier in the 1920s. Other indications that 'altered states of consciousness' might enhance ESP come from some of the earlier experiments in hypnosis, mentioned in the previous chapter. In recent years, apart from the relaxation technique employed in the Ganzfeld experiments, this aspect of ESP phenomena seems to have been unaccountably neglected by parapsychologists.

Precognition

The novelist Morgan Robertson wrote his novels in a sort of semi-trance — while writing he felt as if some other writer took over, employing him as a tool. In 1898 he wrote *Wreck of the Titan*, a novel about a great 'unsinkable' ship, a triple-screwed vessel of 70,000 tons, capable of 25 knots. On her maiden voyage from Southampton to New York, equipped with only 24 lifeboats, she struck an iceberg and sank.

In 1912 the *Titanic*, a giant 'unsinkable' ship, a triple-screwed vessel of 66,000 tons and capable of 25 knots, set out on her maiden voyage from Southampton to New York, equipped with only 20 lifeboats. She struck an iceberg and sank.⁷

When glimpses of future events convey clear and detailed information the implications are disturbing. Is the future really already laid out before us, predetermined, just waiting to happen? When confronted with a single example like the one above there is a strong impulse to dismiss it as just coincidental — though the concept of 'coincidence' is strained when used as an explanation of a concatenation of a number of coincidental details. And when one

considers the enormous number of reports of precognitive occurrences it begins to look like a wholly inadequate explanation. If detailed precognition is real, how much scope is left for freedom of action in shaping future events? The course of future events may not be completely determined, but the reality of precognition would suggest that the 'free will' of individuals has less scope than we usually suppose.

In 1935 Wing Commander Victor Goddard visited a disused airfield at Drem, near Edinburgh. It was in a dilapidated state — the tarmac was cracked, the hangars were disintegrating and cattle grazed on the airfield. Later the same day, flying his Hawker Hart biplane, he encountered thick cloud and heavy rain and got into severe difficulties. He decided to head for Drem to get his bearings. As he flew over Drem airfield he emerged into bright sunlight, and what he saw below was totally at variance with his morning experience. All was neat and tidy. The planes were painted yellow and the mechanics wore blue overalls, which was strange because at that time RAF planes were painted with aluminium and the mechanics' overalls were khaki. No-one looked up as he flew over at low altitude. There was 'something ethereal about the sunlight.' When he told about this hallucinatory experience he was laughed at and his superior officer advised him to 'lay off the whisky.'

In 1939, after the outbreak of war Goddard again visited Drem. The airfield had been renovated and brought back into use. The planes were painted yellow and the mechanics wore blue overalls. A monoplane he had failed to recognise four years earlier he now identified as a Miles Magister.⁸

The painter Victor Brauner joined the group of surrealists in 1933. The surrealist movement, initiated by André Breton, was based on a fascination with the symbolic imagery that arises from the subconscious, expressed through poetry, literature and painting. In 1931 Brauner had painted a horrifying self-portrait in which he depicted himself with an eye missing and the cheek below covered in blood. He had no idea what had motivated him to paint himself in this way. Many of the paintings he produced while a member of the surrealist group reveal an obsession with eyes; in the foreground of *The Last Journey* (1937) is a strange faceless monster, sprouting horns from the place where its eyes should be and holding an eye in its hand. In *Mediterranean Landscape* (1932) is depicted a pair of human figures struggling with each other; entering the eye of one of them is an arrow with a large letter D attached to it. On 27 August 1938 Brauner stepped in to break up a drunken quarrel between two of his associates, just as one of them threw a glass. It struck Brauner in the face and he lost an

eye. The glass had been thrown by Dominguez. Inevitably, the gloomy paintings have been interpreted by many, including Brauner himself, as a premonition of the disaster. After the accident Brauner's painting style drastically changed, taking on a magical, mystical aspect.⁹

Reports of precognition are numerous; the phenomenon appears to be fairly common. Particularly common are premonitions of disaster, sometimes conveyed in clear imagery, and sometimes only as an emotional state — a *foreboding* that cannot be accounted for till after the event it portends. Precognition seems to be most often operative in the dreaming state. Many fascinating accounts of precognitive dreams have been collected by Brian Inglis.¹⁰ Also worth looking into is J.B. Priestley's *Man and Time*¹¹ — a selection from the letters he was deluged with after an appeal on the radio for people to write in.

A few days before he was shot dead by an assassin Abraham Lincoln had a vivid and disturbing dream, which he told to his wife and to Ward Lamon, US Marshal for Columbia at the White House. Lamon recorded the details of the dream in his diary:

... I heard subdued sobs, as if a number of people were weeping. I thought I left my bed and wandered downstairs... I went from room to room; no living person was in sight, but the same mournful sounds of distress met me as I went along. It was light in all the rooms; every object was familiar to me; but where were all the people who were grieving as if their hearts would break?... I arrived at the East room... Before me was a catafalque, on which rested a corpse wrapped in funeral vestments. Around it were stationed soldiers who were acting as guards; and there was a throng of people, some gazing mournfully upon the corpse, whose face was covered, others weeping pitifully. "Who is dead in the White House?" I demanded of one of the soldiers. "The president," was his answer, "he was killed by an assassin!"¹²

On 21 October 1966, after several days of heavy rain, the foundations of the coal-tips at the Welsh mining village of Aberfan gave way. Millions of tons of slag and coal slipped in an avalanche on to the village, killing 144 people, of whom 128 were schoolchildren. Two weeks before the disaster a small girl had said to her mother, "Mummy, I'm not afraid to die." The day before the landslide the same girl told of a dream in which she had seen her school covered in 'something black.' She was one of the children who were killed, and

was buried with the others in a communal grave. The day before the tragedy a woman in Plymouth had recounted a vivid dream to six witnesses at a church meeting. She had seen 'an old schoolhouse in a valley, a Welsh miner, and an avalanche of coal hurtling down a mountain.'¹³

Some precognitive dreams could conceivably be accounted for by a sceptical explanation, such as 'just a coincidence', or the 'explanation' offered by Rawcliffe:

For the believer in the supernatural nothing is easier than transposing the dates of an event and a subsequent dream by a process of wishful thinking; the dream is mistakenly recalled as having occurred before the actual occurrence which it resembled. Many honest people have deceived themselves in this way.¹⁴

Did Abraham Lincoln and the little girl in Aberfan 'deceive themselves in this way'?

Retrocognition

Occasionally, people have experienced 'time slips', during which they have seen a place not as it is but as it once was. Colin Wilson has described several examples of this curious phenomenon.¹⁵

Perhaps the most famous case is the experience of Charlotte Moberly and Eleanor Jourdain, principals of an Oxford college. When visiting the park at Versailles in August 1901 they saw several people in eighteenth-century costumes. They both felt oddly depressed and felt a strange 'dreamlike' sensation. Feeling that something very odd had occurred, they wrote down the events of that day. The following January Miss Jourdain again visited the park and again experienced the 'eerie feeling': 'it was as if I had crossed a line and was suddenly in a circle of influence.' She saw two labourers in peculiar tunics and hoods but when she looked back a second later they had vanished, although she could see a long way in all directions. She heard voices and the rustling of dresses but saw no-one. When the two ladies returned to the park three years later many things were different. Trees had vanished; so had a rustic bridge, a cascade and a kiosk. They studied books on the history of Versailles and its park and became convinced that they had 'seen' the park as it had been in the years before the revolution. In 1911 they published their experiences and their findings. After the

publication of their book several people who lived at Versailles claimed to have had similar experiences.¹⁶

One of the most moving accounts of retrocognitive experience is Jung's description of his visit to Ravenna in 1913, and a second visit twenty years later. Here is his description of what he experienced during his second visit:

... Once more I fell into a strange mood in the tomb of Galla Placidia; once more I was deeply stirred. I was there with an acquaintance, and we went directly from the tomb into the Baptistry of the Orthodox. Here what struck me first was the mild blue light that filled the room; yet I did not wonder about it at all. I did not try to account for its source, and so the wonder of the light without any visible source did not trouble me. I was somewhat amazed because, in place of the windows I remembered having seen on my first visit, there were four great mosaic frescoes of incredible beauty which, it seemed, I had entirely forgotten. I was vexed to find my memory so unreliable. The mosaic on the south side represented the baptism in the Jordan, the second picture, on the north, was of the passage of the children of Israel through the Red Sea; the third, on the east, soon faded from my memory... The fourth mosaic, on the west side of the baptistery, was the most impressive of all. We looked at this one last. It represented Christ holding out his hand to Peter, who was sinking beneath the waves. We stopped in front of this mosaic for at least twenty minutes and discussed the original ritual of baptism... I retained the most distinct memory of the mosaic of Peter sinking, and to this day I can see every detail before my eyes: the blue of the sea, the individual chips of the mosaic, the inscribed scrolls proceeding from the mouths of Peter and Christ, which I attempted to decipher.¹⁷

After leaving the baptistery Jung wanted to buy photos of the mosaics, but was unable to find any. After returning home, he asked an acquaintance who was going to Ravenna to obtain pictures of the mosaics. He was not able to locate any and discovered that the mosaics that Jung had described to him *did not exist*. By this time, Jung had spoken at a seminar about the original conception of baptism and had mentioned the mosaics in the Baptistry of the Orthodox.

The memory of those pictures is still vivid to me. The lady who had been with me long refused to believe that what she had seen with her own eyes had not existed. The experience in Ravenna is among the most curious events of my life. It can scarcely be explained. A certain light may possibly be cast on it by an incident in the story of Galla Placidia (d.450). During a stormy crossing from Byzantium to Ravenna in the worst of winter, she made a vow that if she came through safely, she would build a church and have the perils of the sea represented in it. She kept this vow by building the basilica of San Giovanni in Ravenna and having it adorned with mosaics. In the early middle ages, San Giovanni, together with the mosaics, was destroyed by fire.¹⁸

Dowsing

While this book was in its early stages the following unsolicited anecdote was told to me by a friend and colleague. He is a professor of physics of outstanding intellect whose honesty and integrity are not open to doubt. The house in Bangalore where he still lives was built over twenty years ago. At that time the water supply in its locality was seriously inadequate. A water diviner was called in to advise on the best place on the site to drill a borewell. He employed a forked twig — the time-honoured equipment of water diviners — and wandered over the site. At a particular spot, the twig was seen to lift upwards violently. The diviner reported not only that this was the best place, but also the following: a fairly adequate water supply would be found at a depth of 57 feet; below that, he maintained, was the bedrock, and a very plentiful supply of water was obtainable at 140 feet. The drillers were brought in. Their drilling struck water at 57 feet, and they suggested that there was no point in going deeper. They were persuaded to do so, however, on the strength of the diviner's report. After drilling through rock, water was again encountered at 140 feet. The rates of flow at the two levels also corresponded closely to the estimates the diviner had given. The water supply from the lower level was sufficient to supply a neighbour's house as well as that of the professor and his family.

Water diviners or 'dowsers' are common in most parts of the world where water is scarce. They are relied upon by pragmatic people whose motivation is to save the time and inordinate expense of digging unsuccessful dry wells.¹⁹ The fact that no-one, neither scientists nor the dowsers themselves, has any idea how it works, is not of great concern to them.

In the 1960s a device was marketed in Britain that was supposed to replace the traditional forked twig and make dowsing possible even for people without the special gift. It consisted simply of two steel handles to be held vertically, one in each hand, with a delicately-pivoted horizontal steel rod about 50cm long on the top of each. The swinging motion of the rods was very sensitive to the slightest movements of the handles. One of these devices was owned by the municipal water board in Hull. A friend and I once spent an afternoon playing with it, trying to locate coins under a living-room carpet. It seemed to work, but not consistently, and I would not wish to claim that anything other than luck was operating on this occasion. The engineers and technicians regularly employed the device to trace the course of underground pipes and even to locate blockages and leakages. Time and expense were being spared; their attitude to it was simple: "It works: what does it matter if we can't explain it?"

Dowsing techniques have been used on many occasions to locate metal, oil, coal, archaeological remains, lost property, etc. Experienced dowsers seem to be able to 'tune in' to the kind of object or material they are searching for. Dowsing was used extensively during the Vietnam war. The soldiers used wire coat-hangers bent into an L-shape, one in each hand. They would swing together or apart, indicating the presence of mines or the enemy's hidden tunnels. This began when Louis Matacia, a dowser from Virginia, had demonstrated his ability to locate hidden tunnels on a marine base in the U.S., mapping them with skill and accuracy. The marines in Vietnam unofficially adopted his techniques, using them under battle conditions with considerable success.²⁰

Psychic Archaeology

It has been claimed that certain rare individuals can successfully apply dowsing techniques when they are many miles from a location they do not know, working only with a map and a hand-held pendulum or other simple aid for focusing or 'channelling' the ability. Colin Wilson described how the Welsh dowser Bill Lewis correctly traced the path of a stream on a sketch map, even indicating the point where a pipe ran off at right-angles to supply Wilson's cottage.²¹ Whereas water divining might conceivably be explicable in terms of subtle clues derived subliminally from the recognised senses together with a great deal of experience of the geological pattern of a region, 'map-dowsing' is unambiguously 'paranormal' and belongs to the category of 'clairvoyant' ability.²²

In the summer of 1977 a spectacularly successful experiment²³ under the leadership of Steven A. Schwarz was carried out by a team of scientists, and three psychics: Hella Hammid, who had proved highly successful in identifying objects hundreds of kilometres away, in a series of parapsychology experiments at the Stanford Research Centre in California;²⁴ Ingo Swann, one of the world's most extensively-tested psychics;²⁵ George McMullen, who had worked with archaeologists in Canada and Israel, demonstrating many times his ability to locate unknown sites and to describe the artifacts that would be found.²⁶

At the start of the experiment the psychics were sent navigational charts of an ocean region off the coast of southern California. The area covered by the chart was 3900 square kilometres. They were asked to locate, by clairvoyant means, anything man-made on the ocean floor. None of the three had ever been to the area, and all were many miles away.

They indicated a small area on the chart, corresponding to about ten thousand square metres of ocean, where the depth was 300 feet. They described a wooden-hulled sailing ship, equipped with steam-driven winches, wrecked about 80 to 90 years earlier by burning or exploding amidships, and provided many additional details. Thomas Cooke, a marine-sites expert, testified that no wreck was known in that area, so there was no way the information could have been gleaned from old records.

During the voyage out to the site in the cabin cruiser *Sea Watch* Hella Hammid obtained impressions of a large block of stone showing signs of having been worked by human hands, a wheel with a shaft through its centre, and a peculiar Y-shaped piece of heavily encrusted metal about a metre long with knobs on the ends. She sketched these objects. Once they had arrived at the site, the small research submarine *Taunus* explored the seabed for three hours. After a break for lunch it again submerged and continued the search. After some more time of discouragement and tension, an excited message from the *Taunus* suddenly came through on the intercom: "My God, what's that?... It's a hit — we've done it! There's stuff all over the bottom here!" In the hours that followed, Hella's wheel and Y-shaped object, exactly as she had sketched them, were found. The carved block of stone was found, sticking up from the ocean floor. Later analysis of the Y-shaped object showed that it must have been manufactured at least 75 years earlier. From the debris that was brought up, parts of a wooden hull were identified. Analysis of the maps of the artefact locations led experts to the conclusion that

... by the distribution of the wreckage it is clear that this ship did not just settle to the bottom. She appears to have suffered an explosion amidships, probably due to fire, and only then to have sunk.²⁷

Psychometry

There is in certain ancient things a trace
Of some dim essence – more than form or weight;
A tenuous aether, indeterminate,
Yet linked with all the laws of time and space.
A feint, veiled sign of continuities
That outward eyes can never quite descry;
Of locked dimensions harbouring years gone by,
And out of reach except for hidden keys.

— *H.P. Lovecraft* ²⁸

Theosophists hold the belief that past events do not vanish without trace, but are retained in the form of ‘Akashic Records’. These records are said to be in the form of impressions in the ‘astral plane’, and the information contained in them is available to consciousness in certain circumstances.²⁹ *Akasha* is a Sanskrit word denoting all-pervading space; in Vedic literature it came to mean a fundamental etheric substance from which all things are created by vibration. The evidence for various kinds of paranormal phenomena suggests that the idea of akashic records should perhaps not be dismissed lightly.

There are people who appear to be able, simply by handling an object, to obtain mental impressions relating to its history and, especially, information about people who have owned it. This clairvoyant faculty goes by the name ‘psychometry’.³⁰ It suggests that the operation of the psychophysical world involves a process whereby knowledge attaches itself in some way to inanimate objects (just as it seems, in some cases of ‘apparitions’, to attach itself to specific places, giving rise to the extensive folklore of ghosts and haunted houses). This phenomenon is quite extraordinary. On *a priori* grounds it would seem even less likely to be true than, for example, telepathy or precognition. Yet the evidence for its existence is not negligible. People claiming to have the ability have been used successfully by archaeologists,³¹ and by the police in their criminal investigations. Two of the most famous of these ‘psychic detectives’ were the Dutch clairvoyant Gerard Croiset³² and the American Peter Hurkos.³³ There have been many others.³⁴

Animal ESP

Well-established instances of cats locating their old homes after the family have moved house, taking their pet with them, sometimes over enormous distances, are numerous. Even more remarkable are the instances of cats or dogs locating their owners in their new homes, when they have been left behind. The conclusion seems to be unavoidable that the instinct operating in many of these feats involves some ability to acquire knowledge by 'extra-sensory' or 'paranormal' means. J.B. Rhine collected examples, based on reliable sources of information.³⁵ Lyall Watson mentions a collie dog, abandoned in Indiana, that found its way back to its home in Oregon, 2400 kilometres away. A reporter traced the epic six month journey, finding people who had given food and shelter to the animal along the route.³⁶

In 1914 a British soldier fighting in the trenches on the front line near Armentières received a letter from his wife informing him that his favourite Irish terrier, Prince, was missing. He wrote back: "I am sorry that you have not found Prince. You are not likely to. He is over here with me." Prince had travelled 200 miles through the South of England, found some means of transport across the Channel, and made his way across 60 miles of war-torn French countryside.³⁷

A veterinarian in New York moved to California 2500 miles away, leaving his cat behind. Several months later he was surprised when an identical cat walked into his new home. On examining it he found that it was the *same* cat. He could identify it by an injury to the fourth vertebra of its tail — an injury it had received when it had been bitten as a kitten.³⁸

One of the most impressive examples of the ability of animals to act on knowledge acquired by mysterious means is the story of Hector, a terrier owned by the first officer of a Dutch merchant vessel, the *Simaloer*. In April 1922 Hector got left behind in Vancouver when the ship set sail for Japan. One morning shortly afterwards, Hector was seen running up and down the quayside examining the ships. Shortly after the *Hanley* had set sail for Yokohama, Hector was discovered sitting by the door of the captain's cabin. When the *Hanley* arrived in Yokohama eighteen days later, Hector became excited and barked at a small boat belonging to the *Simaloer*. One of the two men in the boat was Hector's owner, and he and Hector were soon reunited. Kenneth Dodson interviewed the officers of the two ships, and his account was published in the *Reader's Digest*, a magazine famous for its thoroughness in checking the authenticity of its stories.³⁹

The following story was reported by the French Consul General at Istanbul in 1952. Istanbul is a city noteworthy for its large population of stray cats. A merchant vessel from Marseilles took on board a dozen cats in Istanbul. They were well looked after by the crew, and put ashore when the ship next docked at Istanbul. Over a year later, when the ship was again about to arrive, the cats assembled on the very wharf and at the very place where the ship was due to come alongside. This happened in the evening before the ship's arrival, for which there was no regular schedule.⁴⁰

Reports of this kind are 'anecdotal'. There is no convincing reason why they should be discounted on that account. There is a mysterious phenomenon here, that needs to be understood.

In 1940 a government official in Summerville, West Virginia, found a wounded pigeon. His son looked after it until it was well. It disappeared from his home a few days before he was due to be taken to hospital in Philippi, 60 miles away. One night during a snowstorm the boy heard a gentle flapping at the window of his hospital room. The nurse opened it and the pigeon flew in.⁴¹

The ability of pigeons to find their way home from great distances, over unfamiliar territory, is of course a well-known fact. In pigeon-racing, the birds are taken in trains or vans, sometimes very considerable distances, and then released. How they find their way back is a mystery. Orthodox scientific explanation in terms of the position and movement of the sun was ruled out when experiments showed that pigeons fitted with frosted-glass goggles could still find their way home.⁴² The ability is destroyed if a magnet is attached to a pigeon,⁴³ so sensitivity to the Earth's magnetic field must be involved. However, this is in no way a *complete* explanation of the homing ability, as is obvious when one considers the extreme precision required to locate a pigeon-loft from hundreds of miles away, and when one remembers that on their outward journey the metal of the vehicles in which the pigeons are transported distorts and disrupts the Earth's field. For navigation, a compass is not sufficient — a map and a knowledge of one's location with respect to the map is also needed. The instance just mentioned, of a pigeon locating a *person*, clearly lies outside the scope of present understanding of the mechanisms of bird navigation.⁴⁴

Out of the Body Experiences

'Out of the body experiences' (OBEs) are not all that rare. It has been estimated that one person in ten has had an experience of this kind — some people experience the phenomenon many times. In a survey

carried out in 1982 by the psychiatrist Fowler Jones of the University of Kansas, 420 randomly selected people were asked if they had ever had such an experience. 339 claimed that they had!⁴⁵

OBEs often seem to be triggered by stress, trauma or exhaustion, but this is not always so; they also occasionally occur spontaneously without apparent psychological cause. The following is probably fairly typical:

It was evening and I was seated on the bed and leaning over my child's cot reciting nursery rhymes, which he repeated after me. Suddenly I was suspended in mid-air a few feet from the bottom of his cot, looking down on myself still leaning over the cot. I felt very puzzled and bewildered but it was all over in a few seconds. When I got back in my body my son was still repeating a line from the nursery rhyme.⁴⁶

Some people are able to enter into OBE states voluntarily and to exert considerable volitional control over their movements while in this state. In the literature of the 'occult' this is referred to as 'astral travelling'. Sylvan Muldoon had many remarkable experiences of this kind, throughout his life. He recorded them in a book he wrote in collaboration with the parapsychologist Hereward Carrington.⁴⁷ A second book by Muldoon contains many other instances of OBEs, gleaned from the parapsychology literature and from correspondents.⁴⁸ Celia Green's newspaper appeal for readers' out-of-the-body experiences brought in 326 cases.⁴⁹ The parapsychologist Robert Crookall published nine volumes, containing over a thousand reports.⁵⁰

The following vivid description is the report of a young boy at the Aurobindo Ashram in Pondicherry, of his first attempt at 'astral travelling':

I was stretched out in my easy chair, in concentration, when all at once I found myself in my friend's house; he was playing music with several others. I could see very clearly, even more clearly than in the physical, without hindrances. I remained there a good deal, watching, I even tried to draw their attention but they were not conscious. Then, suddenly, there was something that pulled me, like an instinct: I must go back... I remember that to come out of their room which was all closed except for a small opening in the ceiling, my form seemed to vapourize (because I still had a form but it was not that of matter, it was more luminous, less opaque) and I went

out like a smoke by the open window. then I found myself back again in my room near my body and I saw that my head was lying askew, rigid against the cushion, and that I was breathing with difficulty; I wanted to re-enter my body — impossible. This time I was seized with fear. I entered by the legs and then, having come as far as the knees, it was as if I were slipping out; twice, thrice, thus; the consciousness climbed up, then slipped out like a spring. I told myself: if only I could turn over this stool (there was a small stool under my feet), it would make a noise and I would wake up! Nothing doing. And I breathed more and more heavily. I was terribly afraid. Suddenly I remembered Mother and I called: Mother! Mother! and I found myself back in my body, awake, with a stiff neck.⁵¹

Most OBE reports contain only the subjective impressions of a single witness, as in the above two cases. However startlingly vivid and ‘real’ the OBE seems to the percipient, in most reports there is a lack of any objective evidence that anything ‘paranormal’ has taken place. That is to say, the sceptical view that OBEs are simply unusually veridical hallucinatory experiences generated by the brain’s image-making mechanisms, is quite reasonable. This is the opinion, for example, of Susan Blackmore⁵², who has herself experienced the phenomenon. While talking to a friend at a party she suddenly seemed to be viewing the proceedings from a point near the ceiling. She looked down on herself and her friend conversing. She watched with some surprise her own mouth down below, opening and closing, and marvelled at its control. However, the ‘normal’ explanation leaves us puzzled as to why this particularly bizarre kind of hallucinatory experience should occur in so many people. And, of course, it fails to account for those cases in which an OBE provides the percipient with information that can be verified, or those in which the ‘astral body’ is seen by an independent observer. These cases are rare, but they have been reported from time to time.

The following case, reported to Colin Wilson,⁵³ is of special interest in that the percipient obtained information during the OBE that was later corroborated. In 1972 James Pease and his brother Mitch shared an apartment in Milwaukee. About two weeks after James’ wife Susie Bauer had gone away to New York, he caught a glimpse of her entering the living room and looking over his shoulder. After a fraction of a second he realised that this couldn’t be so — she was in New York. His startled reaction attracted Mitch’s attention; Mitch turned

away from the TV to ask what was the matter. James said, "I could have sworn I just saw Susie starting to come into the room." A few minutes later the phone rang. It was Susie calling from New York; she seemed quite upset. She had been sitting on the floor feeling miserable and wishing she were back in Milwaukee. She had then fallen into a kind of trance and felt that she was hovering near the ceiling looking down at her body. She then seemed suddenly to be in the apartment in Milwaukee. She walked across the hall and entered the living room. She then realised that she was 'really' in New York, that this couldn't possibly be happening. When her husband seemed to notice her presence she became frightened by the strangeness of what was happening. She had then opened her eyes and found herself sitting on the floor of her bedroom in New York. She was able to tell her husband where he and Mitch had been sitting, where the beer cans were, what dinner service they had used, where the dirty dishes were, and that the TV had been moved from its usual place and placed on a coffee table — all with perfect accuracy. She also described how Mitch had been sitting back in the sofa with his feet on the coffee table and that her husband had just reached for a beer when he seemed to have noticed her.

The following is an account of a 'lucid dream' experienced by Michael Talbot. As the dream began he found himself hovering in the air above his own body sleeping in bed. The perception of the bedroom and everything in it was unusually vivid — more like waking reality than a dream. He floated into the living room; all perceived details continued to be clear and 'undreamlike'. After drifting around the house for a while 'like some airborne fish', he flew out through the glass of the large living room window. Floating through the woods in the vicinity of his house, he came across a book lying in the grass. It was a volume of the short stories of Guy de Maupassant. Shortly afterwards, the dream ended. During the day that followed this strange dream experience he met a neighbour. She mentioned that she had lost a library book while walking through the woods — it was a collection of short stories by Guy de Maupassant:

Stunned, I related to her my experience of the night before, and together we strolled to the spot where I had seen the book in my dream. And there it was, nestled in the grass exactly as it had been when I had lazily floated over it.⁵⁴

There is a large and growing number of cases of patients having an out-of-the-body experience while unconscious, in a critical

physical condition while undergoing surgery or during resuscitation after a heart attack, and later being able to describe accurately events that took place during their period of unconsciousness — the events are frequently ‘seen’ from a vantage point near the ceiling, as in many other OBE incidents. As well as OBEs, these near-death-experiences (NDEs)⁵⁵ are sometimes accompanied by a feeling of bliss and peacefulness, as in mystical states, and sometimes there is an impression of travelling through a dark tunnel towards a glowing light, with glimpses of dead friends and relatives at the end of the journey. The euphoria and the impression of light at the end of a tunnel have been attributed to the effect of endorphins — opiate-like substances produced by the brain — and the effect on the brain of oxygen starvation.⁵⁶ That may well be — similar experiences are triggered by the administering of certain drugs such as LSD. The OBE phenomenon is less easily explained. The phenomenon has attracted the interest of the medical profession. Dr. Michael Sabom, a cardiologist and Professor of Medicine at Emory University and a staff physician at the Atlanta Medical Center was extremely sceptical until he made his own investigations. In one of his studies, Dr. Sabom used a control group of 25 ‘seasoned cardiac patients’ who had been hospitalised for heart attacks but who had never experienced an OBE. He asked them to describe the medical procedure during their resuscitation. Most of them made major errors in their imaginary descriptions, three gave correct but very general descriptions and two had no idea at all of what took place. Of 32 patients who, after resuscitation, had claimed to have had an OBE during which they ‘saw’ what was going on, six gave specific and correct details of their own particular resuscitation, and one man, who had only a rudimentary medical knowledge, gave an account that was ‘extremely accurate in portraying the appearance, technique, and sequence of the cardiopulmonary resuscitation.’⁵⁷

The following remarkable anecdote is recounted by Charles Berlitz.⁵⁸ Maria, a patient in the Harborview Medical Center, Seattle, while recovering from a heart attack, told the social worker Kimberley Clark that, while unconscious and being resuscitated, she had found herself looking down from the ceiling at the doctors and nurses and her own inert body. While in this ‘out-of-the body’ state she had floated up to a third floor ledge outside the building and had noticed a tennis shoe on the ledge — she asked Kimberley to go up there and see if the shoe were really there. Still highly sceptical, Clark went up to the third floor and pressed her face against the window. There was the shoe on the ledge beneath! She retrieved it and brought it back to Maria. Maria had described accurately how the shoe had a worn patch in the position of

the little toe and how the lace had been stuck under the heel — details that were not visible from the window and could have been seen only from a vantage-point up in the air outside the building.

Lyall Watson tells us that, while on safari in Kenya, the vehicle in which he and a group of colleagues were travelling skidded, overturned twice and came to rest precariously at the edge of a gully. Watson then found himself looking down from a vantage-point outside the vehicle, seeing the head and shoulders of a small boy of the party who had been pushed through the canvas roof by the force of the accident and was in danger of being crushed if the vehicle fell any further. Watson then recovered consciousness in the front seat of the vehicle, climbed through the window and went round to rescue the boy. The vehicle then settled further — the boy would indeed have been killed if Watson had not ‘seen’ his predicament:

My memory of the details ‘seen’ while unconscious is very vivid and there is no doubt in my own mind that my vantage-point at that moment was detached from my body; but even a personal memory of this kind remains remote from any tangible scientific explanation.⁵⁹

Reincarnation

Reincarnation is not exclusively a Buddhist or Hindu concept, but is a part of the history of human origin. It is hoped that intensive and sincere comparative study of the various beliefs regarding reincarnation be carried further in order that a deeper and more scientific understanding can be conceived.

— *The Dalai Lama* ⁶⁰

Belief in reincarnation is deeply embedded in the human psyche — it is archetypal. It is accepted as a matter of fact by many millions of people. Yet from the ‘scientific’ perspective the idea of reincarnation simply does not make sense. To the rational mind, therefore, it is deeply disturbing to read about cases in which small children spontaneously reveal detailed ‘memories of a previous life’ that on investigation turn out to correspond, in considerable detail, to objective fact.⁶¹ On the strength of such evidence it would appear that the nature of memory and its relation to the brain are not at all consistent with the psychoneural identity hypothesis.

The large majority of cases have arisen in South Asia — perhaps because, where traditional belief in reincarnation is strong, the babblings of small children that reveal the phenomenon are less likely to be dismissed as fantasising. For reasons of space, I shall simply give a brief summary of an American case,⁶² which is fairly typical of dozens of other cases that have arisen in many parts of the world.

Interspersed with the childish chatter of Romy Crees, a toddler from Des Moines, were occasional remarks of a bizarre nature. She said she was Joe Williams, the husband of Sheila and the father of three children. She was afraid of motorcycles and described how she (he) had been killed in a motorcycle accident. The description of the accident was so graphic that her parents began to take her remarks seriously, and asked Hemendra Bannerjee, an investigator of 'extracerebral memory' to meet the little girl. He arrived at their home in 1981, with his wife and two journalists. Romy told them she (i.e. he, Joe Williams) had lived in Charles City. His mother's name was Louise Williams. She had pain in her right leg. When he still lived with her she had burned her hand when she threw water on the fire.

Romy, her parents, Bannerjee, and the two journalists travelled the 140 miles to Charles City, a small town of 8000 people. Romy became very excited on the journey. She made them buy some blue flowers to present to Joe's mother. She told them that when they arrived at the house they would not be able to use the front door, but would have to enter by the side door.

Arriving at Charles City, they had to consult the telephone directory to locate the Williams' house. When they drew up in front of it Romy eagerly jumped out of the car and ran towards the front door, on which was a printed label: 'Please use the side door.' The side door was finally opened by an elderly woman on crutches — her right leg was bandaged. *She was Mrs. Louise Williams.* She wouldn't talk to the strangers straightaway because she had an appointment with her doctor — she told them to return in an hour, and closed the door. Romy started to cry.

When they were finally received by Mrs. Williams the emotional rapport between her and Romy was remarkable. Mrs. Williams was particularly touched by Romy's gift of blue flowers — her son's last gift to her had been a bouquet of blue flowers. When Romy's father told her the many things Romy had been saying, she was amazed: "Where did the girl get all this information? I don't know you or anyone else in Des Moines." Mrs. Williams got out a photo of Joe, Sheila and their three children. Romy recognised them instantly.

Joe's marriage to Sheila, the three children, the names of other relatives, the 1975 motorcycle accident near Chicago in which Joe and Sheila were killed, the fire at home where Mrs. Williams burned her hand: these and other details mentioned by Romy were all confirmed. Her precise description of the injuries sustained in the fatal accident were also found to be accurate.⁶³

Joe Williams had died two years before Romy was born.

What Constitutes 'Reliable' Evidence?

Sir Edmond Hornby was the Chief Judge of the Supreme Court of China and Japan. This is his story⁶⁴:

At 1.20 am on the night of 19 January 1875, there was a tap on the judge's bedroom door and a newspaper editor, well-known to the judge, entered. Ignoring the judge's angry requests for him to leave, he sat down on the bed and insisted that he urgently needed the judge's report of the day's court proceedings, for the morning paper. Judge Hornby finally gave in to the editor's insistent manner and dictated a summary of the court proceedings, which the editor took down in shorthand. In response to Judge Hornby's statement that this was the last time any reporter would be allowed into his house, the editor replied, "This is the last time I shall ever see you anywhere." He left at 1.30. Next morning Judge Hornby told his wife what had happened. She said her sleep had been disturbed by talking in the bedroom. When the judge arrived in court the following morning he heard the news that the newspaper editor had died in the night, at one o'clock. In the dead man's notebook were the words 'The Chief Judge gave judgment this morning in this case to the following effect...', followed by some illegible shorthand. When he arrived home Judge Hornby asked his wife to repeat what he had told her in the morning about the editor's visit, and made a brief note of her replies, along with the other facts of the case. An inquest revealed that the editor had died of a heart disease; the coroner told the judge that the deceased could not have left his house during the two hours before he died.

The detailed story, of which the above is a brief summary, was published in a newspaper nine years later. It was eventually included in *Phantasms of the Living* by Gurney, Myers and Podmore.⁶⁵ Judge Hornby remarked, "As I said then, so I say now, I was not asleep, but

wide awake. After a lapse of nine years my memory is still quite clear on the subject. I have not the least doubt I saw the man — have not the least doubt that the conversation took place between us." Lady Hornby confirmed the facts, 'as far as she was cognizant of them.'

After the appearance of the book, the same newspaper that published the story unearthed the following facts:

The editor in question was the Reverend Nivens, editor of the Shanghai Courier.

He died at nine o'clock in the morning.

There was no inquest.

At the time, Judge Hornby was unmarried — his first wife died two years before the alleged events and he remarried three months after them.

There was no record of any court case like the one mentioned in connection with Hornby's story.

When faced with these alleged facts, Judge Hornby was astounded. He commented:

If I had not believed, as I still believe, that every word of it, my story, was accurate, and that my memory was to be relied on, I should not ever have told it as a personal experience.

The idea that Judge Hornby might have been lying seems untenable: he had nothing whatever to gain and a great deal to lose by fabricating a lie. We seem to have, rather, a stunning example of the unreliability of human memory and the astonishing capacity of the human mind for deluding itself. Human memory is not simply a mechanism for storing and retrieving factual information, like the 'memory' of a computer. It is a creative psychic process making intelligible patterns out of the flow of raw experience, building up a subjective reality as a basis for thought and action and giving rise to the awareness of self as a persisting but ever-changing presence. A striking illustration of the way human memory operates was provided by the testimony of President Nixon's legal aide, that emerged during the Watergate trials. Dean recollected dozens of meetings with Nixon in such detail that he earned himself the nickname 'the human tape recorder'. All these meetings had been secretly taped. When the taped conversations were compared with Dean's testimony it was found that, though Dean's memories were broadly correct, he had been mistaken about many of the details of the conversations, and their dates. Significantly, Dean had *sincerely believed* that his memories were

accurate; his psyche had edited them to give *himself* a more central role.⁶⁶

Christopher and Peter Evans⁶⁷ conclude from the Hornby case that all evidence for spontaneous paranormal events is inadmissible as scientific data; only the results of laboratory experiments are to be relied on. But then, once you have thrown doubt on the reliability of human testimony, why should reports of laboratory studies, which are also based on human testimony, be exempt? The ultimate implication to be drawn from the degree of scepticism that the Hornby case seems to warrant is that *all* human testimony is open to a degree of suspicion — no report of any event, normal or ‘paranormal’, can ever carry *absolute* certainty. Take, for example, the subsequent newspaper investigation that unearthed the ‘facts’ that refuted Judge Hornby’s story. Isn’t it legitimate to direct some of the suspicion towards that?

What is one to make of all this? That we must reject *all* reports of spontaneous paranormal events? That would be naive. We have to accept human fallibility as a fact; we live in a world where absolute certainty is rarely if ever attainable, but we need nevertheless to do our best to arrive at reasonable conclusions.

The argument that only laboratory studies of ESP are legitimate and that all evidence for spontaneous cases, being ‘anecdotal’, is not, is unnecessarily restrictive if the aim is to understand the true nature of these phenomena. It is rather like studying animals in cages by putting them through artificial tests and rejecting as ‘unscientific’ the more difficult task of observing their behaviour in their natural environment. The idea that valid knowledge can only emanate from the sacred temple of science — ‘the laboratory’ — is one of the superstitions of the scientific world view.

The accumulated literature on spontaneous paranormal events is vast. Gurney, Myers and Podmore, in their 1300-page work, collected over seven hundred detailed reports. Judge Hornby’s story was just *one* of them, and exceptional in the time elapsed (nine years) before he reported his recollections. Flammarion’s *Death and Its Mysteries*⁶⁸ is another ‘amazing treasure-house of paranormal incidents.’⁶⁹ Louisa Rhine,⁷⁰ in her extensive study and categorisation of spontaneous paranormal events, collected *fifteen thousand* reports. Many more examples of ‘apparitions’ have been provided by Celia Green and Charles McCreery.⁷¹ Is it reasonable to maintain that all of this material can be safely disregarded on the assumption that some kind of delusion might account for every single case? Before rejecting all this data outright on the grounds that human observation is not a

hundred per cent reliable, we need to remind ourselves that *human observation is all we have*.

Apparitions

It often happens that an hallucination is imperfectly developed; the person affected will feel a 'presence' in the room, definitely localised, facing in one particular way, real in the most emphatic sense of the word, often coming suddenly, and as suddenly gone; and yet neither seen, heard, touched, nor cognized in any of the usual 'sensible' ways.

— William James ⁷²

James goes on to quote several descriptions, by the percipients, of this kind of experience. Sometimes the 'sense of a presence' is a prelude to a distinctly visualised hallucination.

E.X. Elfir describes how he was haunted for several years by hallucinations of a girl with whom he had been acquainted at school and who had been killed in a climbing accident:

... I had a strong feeling that she was standing behind me. I turned round. There was nothing to be seen. And yet, *although there was no visual image*, by some strange sense, tactile rather than optical, possibly something like a scanning radar beam, I could make out the whole of her figure with an amazing precision... For some minutes we looked at each other and then the sensation vanished.

On another occasion:

I sat up in bed with the feeling that something unusual was about to happen, though there was nothing to indicate it. When, however, I looked at my wardrobe, which had an oval mirror on its front, I noticed that the outline of the mirror was quivering as though hot air were rising in front of it. Then a kind of grey mist, spread thinly, like tissue paper — it appeared to have no dimension in depth — crept into this trembling area and began to shape slowly into a human figure, down to the waist. The apparition was wrapped in a gauze — grey, motionless, and lifeless. (Oddly, I found later that her

body had been wrapped in gauze to conceal the mutilations suffered in her fall.) Her eyes were closed, lips slightly parted. There came a flash resembling that of an electric spark. A pink light flickered in her cheeks and her eyelids moved slightly... But a perverse devil at the back of my mind flashed a thought harmful to the person of the ghost, without any conscious will on my part. There was a faint swoosh, some electric sparks, the whole thing turned around edge-on and vanished, for, as I said, it was perfectly flat without any dimension in depth. I lay down on my bed and turned to the wall. Out of the solid masonry her face — pink this time, with eyes open — was looking at me, almost point blank and yet somehow far away. Then it grew smaller, and smaller still, as though receding without change of position, and disappeared.⁷³

These experiences might be dismissed as ‘just hallucinations’ — projections from the percipient’s own subconscious mind. After all, Elfir already knew the girl was dead, and none of the unusual perceptions revealed anything he had not already known, with the single exception: his perception of the gauze in which the body had been wrapped. However, the nature and cause of hallucinations is not adequately understood; a sharp distinction between hallucinations and ‘genuinely paranormal’ apparitions may be misleading — there may be no sharp division between the subconscious contents of an individual psyche (the ‘personal unconscious’) and the wider psychic reality associated with extra-sensory perception. The peculiar *two-dimensional appearance* of one of Elfir’s apparitions and the way this apparition *gradually formed itself out of a kind of mist* are features encountered in some of the descriptions of ‘materialisations’ produced in seances.

Louisa Rhine, wife of J.B. Rhine, collected fifteen thousand reports of spontaneous paranormal occurrences. Many of them dealt with apparitions:

[Fifteen years ago] a young couple with three small children lived next door. The lady loved to putter about with cars, so her husband bought an ancient Ford that had to be cranked. She spent hours on that old thing, but a month later she died of a ruptured appendix, and begging for water. One night two weeks later something woke me. Getting up, I seemed to be drawn to the front window, and sure enough there was my neighbour cranking that Ford — she would try the ignition and then go back to cranking. I called my husband to see if he

could see anything and he recognised her. The outline was perfect, but white and transparent. There was no noise.⁷⁴

The next morning the husband of the dead woman, without being informed of these events, said he would have to move out of the house because for the past two nights his wife had appeared by his bedside begging for water. He moved out the following week.

Another example from Louisa Rhine's collection:

I once lived in a three-room apartment on the ground floor. All the doors were locked, so I was sure that nobody could have come in, and I was all alone. It was evening and I was making my bed when all of a sudden I had the feeling that somebody was in the room with me. Looking up, I saw a young man standing in the room, looking at me as if he wanted to say "This is my house, what are you doing in here?" He was dressed in a brown suit, a red tie and black shoes. Before I had a chance to come to my senses he was gone. I had the habit of visiting my landlady every evening, so I told her of my experience. She turned almost green in the face. She told me that not long ago the same man once lived in my apartment and took great pride in fixing it up. But he died in those same rooms leaving a young wife and a baby.⁷⁵

Notice that in both these cases there is an alerting of consciousness prior to the actual apparition: 'something woke me... I seemed to be drawn to the front window'; 'I had the feeling that somebody was in the room with me.' Similarly, Elfir's experiences were preceded by 'a strong feeling that she was standing behind me', and later, he reports a 'feeling that something unusual was about to happen though there was nothing to indicate it.' We see from these examples that an extra-sensory perception may be unaccompanied by sensory imagery — a phenomenon is conveyed to consciousness by a change in the state of alertness, accompanied by changes in emotional state without identifiable cause. There appears to be a scale of strength of extra-sensory impressions, ranging from 'an uncanny feeling' to a vividly real experience with all the clarity of a sensory perception. The story of the apparition of the young man in the brown suit draws attention to a characteristic of many cases of apparitions — their association with particular *places*. The whole of the traditional lore of 'haunted houses' arises from this phenomenon.⁷⁶ In some totally mysterious way, certain localities, especially old houses, seem to

induce paranormal perceptions in sensitive individuals — they see ‘ghosts’. The phenomenon of psychometry suggests that, similarly, various material objects carry an associated ‘psychic field of information’ that can be accessed by an appropriate state of consciousness.

Very many apparitions take the form of images of persons who have recently died.⁷⁷ A typical example, recorded by Louisa Rhine, is the experience of a night-watchman of an office block in Boston. Mr. Arnold and Mr. Bartlett worked for the same organisation. Leaving after work one evening, they descended in the lift together and parted before leaving the building. At midnight the night-watchman came on duty. In making his rounds, he approached the adjacent offices of Mr. Arnold and Mr. Bartlett, and saw Bartlett entering Arnold’s room. He spoke to him and was surprised that Bartlett did not reply. On entering Arnold’s room to talk to Bartlett, he found no-one there. On Mr. Arnold’s desk was a book the nightwatchman had seen in Mr. Bartlett’s hand a few moments earlier. He called repeatedly for Mr. Bartlett and searched the whole building. The experience disturbed him considerably and he was relieved to be able to relate it to the day-watchman who came on duty the following morning. He then learned from the day-watchman that Mr. Bartlett had collapsed and died at five o’clock the previous evening as he was about to leave the building.⁷⁸

In January 1919 D.R. McConnell wrote to Oliver Lodge, a professor of physics and President of the Society for Psychical Research, reporting the following circumstances associated with the death of his son David.⁷⁹ Lieutenant David McConnell was an officer in the RAF, stationed at Lincoln. On the morning of 7 December 1918 he awoke late, missing his breakfast and a parade. During the morning he was unexpectedly asked to deliver a plane to Tadcaster, 60 miles away. He began the flight at about noon, accompanied by a two-seater plane which was to bring him back. The two planes ran into thick fog. Approaching the airfield at Tadcaster, David’s plane crashed and he was killed. It was 3.15.

Before setting off, David had entered his room, telling his room-mate, Lt. Larkin, about the trip he was about to make to Tadcaster and saying, "I expect to get back in time for tea. Cheerio." In the afternoon Larkin was sitting by the fire writing letters. At about 3.15 or 3.30 he heard footsteps in the passage and the door opened. Larkin saw David standing in the doorway in his flying gear. Larkin said, "Hello, back already?", to which David replied, "Yes, got there all right — had a good trip." Shortly afterwards, at 3.45, Lt. Gardner-

Smith entered the room saying, "I hope Mac [i.e. David] gets back early." Larkin replied, "He *is* back, he was in this room a few minutes ago." In the evening Larkin received the news that David had been killed near Tadcaster:

Next morning Gardner-Smith and I had a long discussion about my experience. He tried to persuade me I must have been mistaken, that I had not seen Mac on the previous afternoon at about 3.30, but I insisted that I had seen him.

There are two signed corroborative statements:

Mr. Larkin has related almost word for word what he told me on the afternoon of 7 December 1918 at about a quarter to four. Knowing the type of man he is, I most certainly believe this strange occurrence, but I am at a loss to explain it.

— *Gerard Gardner-Smith, Lieut., RAF.*

On Sunday morning, December 8th [1918], Mr. Larkin told me the story exactly as he has written it down here...

— *R. Mowat Hillman, Lieut., RAF.*

Another rather similar incident, also associated with the RAF at Lincoln, happened to Wilbur Wright in 1941. Late one night he returned from leave and went into one of the hangars to retrieve some cigarettes he had left there. He entered the hangar in the dark through its main door and heard a noise coming from the aircrew room on the right. He entered the room to investigate and switched on the light. Leading aircraftman Stoker was there, in full flying gear, rummaging in one of the lockers. When Wright asked him what he was doing, Stoker said "I can't find my bloody gloves." Wright replied "Well, that's your problem. Put out the light when you go", and then went out into the main hangar, got his cigarettes and left. At breakfast the next morning he questioned his colleagues about the events during his leave. He was told that the bomber in which Stoker was the gunner had been lost over Germany two night earlier. "My God," said Wright, "that chap Stoker had a lucky escape then!" — "Stoker? Oh, he was in with the rest. There was trouble before they took off — he couldn't find his flying gloves. He could have been frozen to death with the rear gun hatch open." Wright said nothing, but was deeply disturbed. He reported sick two days later and told the medical officer of his experience in the hangar. The Medical Officer believed him and asked him to write out

an account of what had happened. In reporting these events to Colin Wilson, Wright emphasised that the apparition of Stoker in the hangar seemed solid and real, not at all ‘ghostly’. The only oddity, that Stoker was searching for his gloves in the dark, did not strike Wright till later. This occurrence is not the only paranormal experience in Wilbur Wright’s life. Colin Wilson records several others, in particular Wright’s remarkable precognitive dreams.⁸⁰

Apparitions are not always associated with the death of the person paranormally perceived, though this seems to be a common type. In his autobiographical writings, the German poet Goethe recorded an occasion on which he saw an apparition of himself: When riding along a footpath feeling unhappy because he was leaving Frederika, the girl he had wanted to marry, Goethe saw ‘not with the eyes of the body, but with the eyes of the mind’ an image of himself coming towards him on horseback. The figure was dressed in a peculiar shade of grey, with some gold trimmings — a kind of garment he had never in fact worn. ‘As soon as I shook myself out of this dream, the figure disappeared.’ Eight years later, returning to meet Frederika again, he found himself on the very same road, dressed ‘not by choice but by accident’ in the very same garments he had seen on the hallucinatory figure.⁸¹

On another occasion, Goethe was walking towards Weimar with a companion. Suddenly, to the astonishment of his companion, Goethe stopped and exclaimed: “If I weren’t sure my friend Frederick is at this minute in Frankfurt, I’d swear it was he!” His companion saw no-one, and became even more alarmed when Goethe said “It is he!” and proceeded to ask ‘Frederick’ what he was doing there, wearing Goethe’s dressing-gown and bedroom slippers. When Goethe found his companion was seeing nothing he realised he must be hallucinating, and became worried that this might be a premonition of Frederick’s death. But when Goethe arrived home his friend Frederick was there, alive and well, wearing Goethe’s dressing-gown and slippers. He had got soaked in the rain on his way to visit Goethe and had changed out of his wet clothes. He had then fallen asleep in Goethe’s armchair and dreamt of the meeting on the road to Weimar.⁸²

One could argue that the highly imaginative Goethe might have made up a little fiction to add spice to his autobiography; but something about the trivial and mundane nature of the circumstantial details in these anecdotes suggests otherwise.

In Tibet, belief in paranormal occurrences is widespread, but they are regarded as part of the natural order of things, manifestations of the *rational* laws that underlie reality.⁸³ A technique of meditation

employed in Tibet emphasises the development of the imaginative faculty; exercises are aimed at developing clear and detailed mental imagery. It is claimed that, by means of these exercises, what we would call apparitions can be created artificially and can become 'real' enough to be witnessed by more than one person. These manifestations are called 'tulpas'. Alexandra David-Neel spent many years in Tibet, and described her own attempt to create a tulpa:

I chose for my experiment a most insignificant character: a monk, short and fat, of an innocent and jolly type. I proceeded to perform the prescribed concentration of thought and other rites. After a few months the phantom monk was formed. His form grew gradually *fixed* and lifelike. He became a kind of guest, living in my apartment. When I started on a tour with my servants and tents, the monk accompanied us. Now and then it was not necessary for me to think of him to make him appear. He performed actions that are natural to travellers, that I had not commanded; for instance he walked, stopped, looked around. The illusion was mostly visual but occasionally I felt his robe brush against me and once his hand seemed to touch my shoulder. His features gradually underwent a change. He became leaner and his face assumed a vaguely mocking, sly, malignant look. Once, a herdsman who brought me a present of butter saw the tulpa in my tent and took it for a live lama ... There is nothing strange in the fact that I may have created my own hallucination. The interesting point is that in these cases of materialisation, others see the thought forms that have been created.⁸⁴

David-Neel reports that, after the tulpa had got out of her control and begun to get on her nerves, it took her six months of hard struggle to get rid of it.

One day, she was visited by a Tibetan artist who specialised in painting wrathful deities, and saw behind him a nebulous shape resembling one of these beings. She reached out to it and felt a soft object; then it vanished. The painter himself had been unaware of it, but said that he had been concentrating on that particular deity for several weeks and had been working on a painting of it that very morning.⁸⁵

The following anecdote seems to suggest something very similar to the tulpa phenomenon: Violet Tweedale relates that, at a fancy-dress ball, she was dancing with the rich and handsome Prince Valory, when she saw behind him a curious figure with pointed ears

that looked like a satyr. It was not, however, a guest in fancy dress. When she mentioned it to her partner he turned pale and said “If you can see it too you must be clairvoyant. Luckily, very few people can. I have tried to get rid of it, but I can’t.” Violet Tweedale also mentions a general who had a ghostly companion of the same kind, but he was more nonchalant than the Prince and even made jokes about it.⁸⁶

Visualising mental formations, whether voluntarily or involuntarily, is a most mysterious process. What becomes of these creations? May it not be that like children of our flesh, these children of our minds separate their lives from ours, escape our control, and play parts of their own?

— *Kushog Wanchen* ⁸⁷

For obvious reasons, the *recorded* cases of apparitions, and indeed, of paranormal occurrences in general, that contribute to the literature on the subject, are likely to be only a small proportion of the number of actual occurrences. It is highly likely that unspectacular paranormal experience is quite common, but that instances only come to light and get permanently recorded when requests for such anecdotal material are made by authors interested in the topic. The following incident is perhaps fairly typical, and hints at an answer to the sceptic’s question, ‘If the paranormal is real, why is it not more common?’ :

A large black cat used to be ‘seen’ quite frequently by a woman and her daughter, who decided not to tell anyone in case the house acquired the reputation of being haunted. When the mother, hearing of Celia Green’s request for stories of apparitions, decided to write to tell her about the ghost cat, and mentioned it to her husband, he said “Oh, that cat.” He had not said anything, he explained, in case it would make them nervous.⁸⁸

Gustav Meyrink was a bank director in Prague. After a nervous breakdown and suicide attempt at the age of twenty-four (in 1891) he began intensive studies of ‘occult’ subjects, which included cabalism, freemasonry, theosophy, yoga, alchemy, and experiments with hashish. At the age of 34 he began to write short stories and novels, and achieved fame as an author of fantastic and occult fiction. In several essays he has described his own personal experiences of the paranormal. Whether it is to be believed or not, the following account of a particularly weird apparition is quite fascinating. I shall give in

full a literal translation of Meyrink's account, entitled 'My Most Remarkable Vision'⁸⁹ :

One day in the autumn of 1915, I had a remarkable vision. The circumstances associated with it open up perspectives of an astonishing kind. As I was pondering over the probable inner causes of the terrible World War, I felt coming over me the refreshing heightened awareness that always comes when I am about to experience something out of the ordinary. Immediately, I saw an apparition of a man, of unidentifiable race. He was very tall and thin. I have described him in my short story 'Das Grillenspiel'⁹⁰, published in the magazine *Simplicissimus* and in my anthology *Fledermäuse*, as follows: 'Six feet tall, unusually slim, beardless, his face with an olive-green iridescence, the eyes slanting and unnaturally wide apart. His lips, like the skin of his face, free of wrinkles as if made of porcelain, as sharp as a knife, bright red and strongly curved, as if in a pitiless rigid smile; they appeared as if painted. On his head, a strange red hat.'

Before the apparition I had asked myself what could be the deeper causes of the war; the vision seemed to me to be a symbolic answer. Namely, the Asiatic occultists believed there existed a Tibetan-Chinese Sect — called 'Dugpas' — who were the tools of the destructive forces of the universe, I sat down and wrote the story 'Das Grillenspiel' in which I introduced this 'occult' cause of the war. As well as the vision of the man, other visions of mine were built into the setting and circumstances of the story. I constructed the framework of the story from my imagination. The story was published in *Simplicissimus* and a few weeks went by. I then received a letter from a painter in Breslau, whom I did not know — I believe his name was Höcker. In it, he wrote as follows:

I have to say straightaway that I am of sound mind and have never suffered from hallucinations or anything of that kind. Yesterday I sat at the table in my studio and worked. Suddenly, I heard a metallic singing noise. I turned round and saw a tall man, of a race that I could not identify, standing in my room. He wore a peculiar red hat. I realised immediately that this could only be the result of some mental disturbance in myself. The man held a kind of tuning-fork in his hand, with two branches, by means of which he was bringing forth the noise. In the middle of the tuning fork was a clapper. Immediately, an enormous cloud of large white insects came out of the floor and began to tear each other to pieces with their whirring wings, while the noise grew to an intolerable pitch. Even now I can still hear this nerve-shattering noise in my ears. As soon as the hallucination ceased I took up a red pencil and drew what I had seen I then went out into the fresh

air. I came to a newspaper stand and gave in to an impulse — which I do not understand because I do not actually like the magazine *Simplicissimus*. As the newsagent handed me a copy I said, again acting on an unaccountable impulse, “Not that one, the previous issue, please.” On returning home I leafed through it and read, to my measureless astonishment, in your story *Das Grillenspiel*. almost exactly what I had myself experienced an hour earlier: the man in the red hat, the insects tearing each other apart, etc. Please give me some explanation so that I can understand the matter. Yours, Höcker.

I read the letter through a second time and then laid it aside, grew annoyed and said to myself: yet again, somebody who wants to make himself interesting; obviously, the man must have previously read the *Simplicissimus* and expects me to believe that he had predicted it all in a vision. In order to compare, I took up my copy of *Simplicissimus* and read the corresponding paragraph. I got a violent shock as I read ‘The Dugpa (namely, the man in the red hat) held a glass prism (not a tuning fork!) against the sun, etc.’ I held my head and said to myself: before I wrote the story, I had several times seen in a vision that the Dugpa held a tuning-fork, just as in Höcker’s letter! How had it come to be a prism, here in *Simplicissimus*? Then I remembered that I had filed away the first draft and written out a neat version to send to the publisher, as is my habit. In doing so, I had replaced the tuning fork by a prism. Excited, I rummaged through my drawer until I found the first draft. Correct: there was the tuning-fork! (No-one but myself had ever seen this earlier manuscript; moreover, no-one would have been able to decipher it since it was written with abbreviations legible only to me.) I could no longer doubt that this Höcker — admittedly weeks later than me — had had the same vision as me; either that, or a totally unprecedented coincidence had its hand in the game. Such an explanation would surely be the most unlikely that one could construct! How then explain the occurrence? Here, I am groping in darkness. Telepathy after weeks? — sent out by me? Nonsense! I know that certain occultists would say that I had, as a result of writing the story, buried a picture in the ‘Akashic Records’ — the brain of the universe — that had then suddenly become visible to Mr. Höcker. Such an explanation has great holes. It does not explain why Mr. Höcker, *quasi* against his will, had bought the appropriate issue of *Simplicissimus*. Spiritualists would say: spirits had influenced him.

Seances

In March 1845 the Fox family of Wayne County, New York, was disturbed by frequent unaccountable ‘rapping’ noises in their house. One evening the two Fox sisters, aged twelve and fifteen, asked the ‘spirit’ to produce raps corresponding to their finger-snapping. It did so. They devised a code to enable it to communicate with them. In the presence of a roomful of neighbours, it was interrogated. It claimed to be the spirit of a man who had been murdered in the house and buried in the cellar. Subsequent digging in the cellar revealed human remains.⁹¹ What is remarkable about this incident is not that it provides particularly compelling evidence for the existence of ‘spirits’, but that, once it became widely publicised, it started a craze. Many groups of people began to claim that their psychic experimentation had produced supernatural noises and other bizarre phenomena. Eventually, the pastime spread throughout America and Europe and gave rise to ‘spiritualism’, a religion centred around belief in the possibility of communication with spirits of the dead.

In a typical spiritualist ‘seance’ a group of people, including a gifted ‘psychic’ or ‘medium’, sits in a darkened room. While the medium is in a trance or trancelike state various fantastic phenomena are said to take place. Typically:

Rapping or knocking noises from furniture or walls is heard. Voices emanating from the mouth of the medium claim to be dead relatives of those present, sometimes revealing information known only to the person concerned and unknown to the medium.

‘Ectoplasm’, a mysterious cloudlike substance, is said to emerge from the bodies of some mediums, or to form itself in the air, and to take on recognisable shapes such as faces or hands. According to Crookes, a luminous cloud seems to form, ‘then it becomes concentrated, takes on a shape and changes into a perfectly formed hand, of which the flesh seems as human as that of the people present.

‘Apports’ — materialisations of objects — occur.

Lifelike apparitions appear.

Luminous ‘sparks, stars, globes of light, luminous clouds, etc.’ float around the darkened room. Crookes reported that ‘under the strictest of test conditions I have seen a solid luminous body, the size and nearly the shape of a turkey’s egg, float noiselessly about the room. It was visible for more than ten minutes, and before it faded away it struck the table three times with a sound like that of a hard, solid body.’⁹²

At one time eminent scientists of the highest repute were prepared to devote much time and effort to the careful investigation of the claims made on behalf of mediums. But the wild superstitious beliefs of spiritualists, and the frequency with which alleged ‘mediums’ turned out to be nothing more than clever conjurers exploiting the gullibility of their onlookers, have spread a miasma of disreputability around the topic of medium-induced phenomena. Modern parapsychologists therefore tend to shy away from this kind of investigation. The literature on the investigation of mediums is bewildering and irritating. On the one hand there are intelligent trained observers — sometimes scientists of the highest calibre — objectively describing events they have witnessed under conditions that appear to rule out any possibility of fraud. On the other hand we have the pronouncements of sceptics who insist that the testimony is worthless because the investigators have failed to offer incontrovertible proof that they were not being deceived by tricks. Rawcliffe⁹³ goes even further, insisting that observations are invalidated if the scientific investigators even *believe in the possibility* of genuine paranormal phenomena, because then their ‘objectivity’ is suspect. In this kind of intellectual atmosphere the possibility of genuine scientific inquiry is destroyed. In responding to sceptical objections, investigators adopted methodologies that often seem to be merely elaborate devices for exposing fraud, rather than for the scientific investigation of phenomena.

Nevertheless, many of the reports of observations made at seances remain impressive.

The most famous medium of all was Daniel Dunglas Home.⁹⁴ He was born in Edinburgh in 1833. His mother was a noted ‘seer’ — she foretold the deaths of relatives and friends. Daniel himself began to have clairvoyant experiences at the age of four, ‘seeing’ what was happening at distant places. At the age of nine he went to live in America with an aunt and uncle. He became the focus of poltergeist activity; tables would slide around rooms and raps would be heard coming from various parts of the room at breakfast time. Public demonstrations of his paranormal abilities began when he left home in 1851. A committee from Harvard testified that, while they held Home’s arms and legs — at his request — the heavy table at which they were sitting floated above the floor and slid towards them, pushing them backwards. The floor had then vibrated and the table rose up on two legs ‘like a horse rearing.’

Throughout his life, Home travelled in Britain, France and Italy, demonstrating his powers on numerous occasions. His fame, and the spectacular nature of the phenomena, increased. He became a

celebrity. Unlike most mediums, who needed to operate in darkened rooms, Home eventually took to demonstrating the phenomena in broad daylight.

As to the phenomena themselves, he insisted that he knew no more about them than any of his audience. Things simply happened when he was in the room; all he had to do was relax and put himself in the mood.⁹⁵

Thousands of witnesses, including some of the most famous people in Europe, testified to having witnessed ‘incredible’ happenings at Home’s demonstrations. No sceptics have satisfactorily ‘explained away’ any of this testimony; indeed, sceptics who agreed to witness one of Home’s seances tended to come away convinced and bewildered. No accusations of fraud have been levelled against Home — except, inevitably, a few totally baseless slanders by people who had not taken the trouble to investigate for themselves.

In 1871, while Home was in London, he agreed to be investigated by the brilliant physicist William Crookes. To the dismay of the sceptics, Crookes concluded that, though his rational mind told him that what he had witnessed was ‘impossible’, he was forced to admit that the wide variety of paranormal phenomena produced by Home was real.⁹⁶ The following is Crookes’ testimony of his observation of levitations taking place at seances, including Home’s demonstrations of the phenomena:

This [the levitation of human beings] has occurred in my presence on four occasions in darkness; the test conditions under which they took place were quite satisfactory, so far as the judgement was concerned; but ocular demonstration of such a fact is so necessary to disturb our preformed opinions as to ‘the naturally possible and the impossible’, that I will here only mention cases in which the deductions of reason were confirmed by the sense of sight.

On one occasion I witnessed a chair, with a lady sitting on it, rise several inches from the ground. On another occasion, to avoid the suspicion of this being in some way performed by herself, the lady knelt on the chair in such a manner that its four feet were visible to us. It then rose about three inches, and then slowly descended. At another time two children, on separate occasions, rose from the floor with their chairs, in full daylight, under (to me) most satisfactory conditions; for I was

kneeling and keeping close watch upon the feet of the chair, and observing that no-one might touch them.

The most striking cases of levitation which I have witnessed have been with Mr. Home. On three separate occasions I have seen him raised completely from the floor of the room. Once sitting in an easy chair, and once standing up. On each occasion I had full opportunity of watching as it was taking place.

There are at least a hundred recorded instances of Mr. Home's rising from the ground, in the presence of many separate persons, and I have heard from the lips of the three witnesses to the most startling occurrence of this kind — the Earl of Dunraven, Lord Lindsay, and Captain C. Wynne — their own most minute accounts of what took place. To reject the recorded evidence on this subject is to reject all human testimony whatever; for no fact in sacred or profane history is supported by a stronger array of proof.

The accumulated testimony establishing Mr. Home's levitations is overwhelming. It is greatly to be desired that some person, whose evidence would be accepted as conclusive by the scientific world — if indeed there lives a person whose testimony *in favour* of such phenomena would be taken — would seriously and patiently examine these alleged facts. Most of the eye-witnesses to these levitations are still living, and would, doubtless, be willing to give their evidence. But, in a few years, such *direct* evidence will be difficult, if not impossible, to be obtained.⁹⁷

Jung read out the above passage in a lecture he gave in Basel in 1905,⁹⁸ and then proceeded to discuss it in terms of Crookes' psychology:

Crookes and his observations must remain for the present an unsolved psychological enigma ...

... in spite of our sympathy, we may leave out of account the question of the physical reality of such phenomena, and instead turn our attention to the psychological question: how does a thinking person, who has shown his sober-mindedness and gift for scientific observation to good advantage in other fields, come to assert that something inconceivable is real?⁹⁹

In Jung's later writings, a gradual shift took place as, with growing maturity and experience, he moved away from this initial incredulous

attitude to the paranormal. The 'psychological enigma' takes on a totally different aspect once you become willing to consider the possibility that Crookes and others were convinced by what they saw in Home's presence because the 'inconceivable' events they observed did in fact take place. There have been many eye-witness reports of human levitations throughout history. St. Teresa of Avila is reported to have risen into the air while in mystical ecstasy, on more than one occasion.¹⁰⁰ Scores of eye-witnesses, including Pope Urban VIII, testified to having seen Joseph of Copertino, a simple-minded 17th century monk, floating in the air. Joseph was observed to float above the heads of the congregated monks, on many occasions. He once came to land on the high altar, among the lighted candles. His frequent flights met with the disapproval of the authorities and he was banned from attending mass. Walking in the monastery garden, he soared up into the branches of a tree; a ladder had to be brought for him to get down. Finally, the doctor who attended Joseph as he was dying described how the dying man had been lying a few inches above the bed.¹⁰¹

The seance at which Crookes was not present, that was described to him by three witnesses, is the famous occasion on which Home was seen to float horizontally out of a third-storey window and in at the window of an adjacent room.¹⁰²

Another very strange phenomenon frequently demonstrated by Home was 'incombustibility':

William Stanton Moses described how he had seen Home go into a trance; he 'ruffled his bushy hair until it stood out like a mop and then deliberately lay down and put his head in the bright wood fire. Crookes, who was present on this and other occasions, satisfied himself that Home was not using a form of protection. After Home had carried around a glowing coal, Crookes examined his hand: 'I could detect no trace of injury to the skin, which was soft and delicate like a woman's. Neither were there signs of any preparations having been previously applied. Among others who confirmed Home's immunity to fire, Lord Adare described watching him in a seance in 1868; 'after stirring the embers to a flame, he placed his face right down among the burning coals, moving it about as though bathing it in water.' The novelist Mrs. Samuel Carter Hall testified that she had seen Home place a 'huge lump of red-hot burning coal' on her husband's head: 'I have often wondered since why I was not frightened; but I was not. I had perfect faith that he would not be injured. Someone said,

‘Is it not hot?’ Mr. Hall answered, ‘Warm but not hot.’ Mr. Home then proceeded to draw up Mr. Hall’s white hair over the red coal; Mr. Home drew the hair into a sort of pyramid, the coal, still red, shining beneath the hair.’ Home then handed the coal to Mrs. Hall, who also felt it was ‘warm’ — yet when she bent down to take a closer look at it, the heat coming from it was sufficiently intense to make her draw her face back.¹⁰³

Another famous medium who needs to be mentioned is Eusapia Palladino¹⁰⁴. The phenomena that took place during her trance states were limited in variety; they had none of the spectacular and fantastic flavour of Home’s seances. They consisted mainly of movements and levitations of small items of furniture not far from her, while her hands and feet were constrained by those present. She always insisted on low levels of illumination — the strongest lighting used at any of her demonstrations appears to have been ‘sufficient for someone sitting at the seance table to read small print holding it at an ordinary distance from the face — everything in the room was clearly visible, patterns of carpet and furniture covers, texture of skin of hands, etc.’¹⁰⁵ Moreover, on many occasions she was discovered cheating — whenever the opportunity arose she resorted to fraud and trickery to produce furniture levitations. She explained this by claiming that, when in her trance state, she was unaware of what she was doing — it was up to the investigators to constrain her. All this, of course, makes her ludicrous in the eyes of sceptics.¹⁰⁶ Nevertheless, her fame came from the large number of intensive investigations by dozens of competent observers — including some of the most distinguished scientists of Britain, France and Italy — who witnessed very strange occurrences under conditions that seemed to rule out any possibility of fraud. The case of Eusapia Palladino is now largely of interest for its illustration of the elusiveness of truth, and for the insights it gives into the psychology of scepticism and of gullibility, and the fog of obscurity that is so easily generated.

Between 1904 and 1906 the most elaborate of the many serious investigations of Eusapia’s seances were made by Jules Courtier, Professor of Psychology at the Sorbonne. Pierre and Marie Curie were among the many eminent scientists who witnessed these investigations. The reports speak of movements of furniture at a distance from Eusapia, musical sounds, and investigators feeling themselves pinched or their hair pulled. Sometimes the knots in their cravats would come untied. Pierre Curie described how a stool outside the circle of investigators came towards him and seemed to attempt to

climb onto him, and how a small table soared off the floor and into the circle, making a 'pretty curve' in the air.¹⁰⁷

Eusapia was later extensively investigated in Naples by three members of the Society for Psychical Research with considerable experience in exposing fraudulent mediums. In these tests she sometimes allowed the light levels to be increased to facilitate observation. The investigators concluded that the furniture movements they had witnessed were genuinely mysterious.¹⁰⁸

In 1972 a group of eight members of the Toronto Society for Psychical Research decided to meet regularly to try to 'create a ghost'¹⁰⁹ — a concept reminiscent of the Tibetan 'tulpa'. They invented a fictitious character whom they called 'Philip' and made up a detailed biography for him. They decided that he was to be an English aristocrat of the 17th Century, that his wife's name was Dorothea, that he had a gypsy mistress called Margo, and so on. They decided what he had looked like and what kinds of food he liked to eat. They incorporated some fictitious historical events into his life story.

The group then met once a week to hold seances, to try to 'contact the spirit' of this totally fictitious person. Their persistence was quite astonishing — for a whole year, nothing whatever happened. They then adopted a change of technique. Instead of sitting in meditative silence round the table in a state of high seriousness, they relaxed and began to spend the seance periods in a light-hearted mood, talking, telling jokes, laughing and singing. After only a few sessions of this kind, to their astonishment, loud raps began to come from the surface of the table. They established a code in order to communicate with the 'entity' producing these noises.

It claimed to be Philip.

Its response to questions put by the group were in general in agreement with the biography the group had devised a year previously. But not always — 'Philip' sometimes contradicted them. He incorporated the historical inaccuracies into his story. Eventually, he gave many details that went beyond the prepared biography; for example, he claimed that his parents had died of smallpox, and he revealed details about his hunting activities. A distinctive personality emerged; he seemed childish and moody, showing annoyance when the group neglected him or when they interrogated him for too long.

The raps emanated at first only from the table. Later, they came from the walls as well. Tape-recordings were analysed by an acoustics engineer. The raps did not rise and fall in the way an ordinary percussion noise would, and they were of short duration — only about a third the length of the sound made by a person rapping with knuckles

or tapping a foot. Sometimes Philip communicated with scratching noises instead of raps. This happened especially when his wife Dorothea, whom he did not like, was mentioned.

The Philip phenomenon strengthened as the series of seances continued. Eventually the table began to move around, sometimes with only one leg in contact with the floor, and sometimes it moved up the walls. Small objects would be tipped off the table on these occasions — except for those that had been designated as ‘gifts for Philip’, which stayed in place even when the table tipped at precarious angles.

The Canadian Broadcasting Corporation filmed one of the seances in November 1973. The rapping phenomenon manifested itself unabated in the presence of the camera crew, and the table ‘danced around the room’ in the full glare of the arc lights. This was filmed. Later, several more documentary films were made and Philip even performed live for Canadian television, in the presence of a studio audience:

... It was soon obvious that Philip felt that his place was up on the platform with the moderator and the panelists. The table tried every way to get on to that platform. There were three overhanging steps to the platform. It took quite a while, and a fair amount of maneuvering before it managed it. The whole procedure was hilarious, and the camera crew succeeded in filming the entire proceeding. Philip had to indulge in some quite complicated positioning with the legs of the table in order to climb on to the platform. Once there, it made straight for the moderator, who was asked by one of the group to say hello to Philip. He looked somewhat doubtful, but did as requested, placed his hand on the table and said, ‘Hello Philip’. He was obviously surprised as were the television crew and audience, when a very loud rap came in reply right underneath his hand. He continued to ask questions and receive raps in reply. These were all recorded and filmed. The program was televised over the Toronto City TV system and was broadcast in Toronto, on the program *World of the Unexplained*.¹¹⁰

Sorcery

The reports that we have been presenting are, admittedly, ‘fantastic’. Without a willingness to acknowledge that we might at present be ignorant of the deeper principles of operation of the psychophysical

world, it seems probable that no amount of evidence is going to *convince* anyone of the reality of the phenomena described in the reports. Only *understanding* (i.e., satisfactory explanation), not evidence, can be fully convincing, and understanding is, unfortunately, lacking. Let us therefore accept the reality of these phenomena *as a heuristic hypothesis*. Let us suppose that the intrusion of the ‘fantastic’ into the world of ordinary reality does sometimes take place, for reasons unknown. The question then arises: what are the limits of the possible? In particular, is volitional control over the autonomous processes behind paranormal occurrences possible?

Folklore and fairy-tales abound in stories of wizards, magicians or sorcerers — people with fantastic powers to control and direct events by ‘supernatural’ means. Are there any *real* sorcerers outside the imaginary world of fiction?

Evidence in favour of this supposition is meagre. It is very definitely of the ‘anecdotal’ type. But evidence does exist.¹¹¹ Idries Shah, a leading expert on the Sufi mystics, and the author of several scholarly books, has described events that he says occurred when a Hindu magician visited his bungalow one evening, to demonstrate his magical powers. After Shah had satisfied himself that the man had brought no conjuring apparatus or accomplice with him, he asked the man if he could cause a chair to levitate. Knitting his brow in concentration, the man extended his hands towards the largest chair on the verandah. Within a few seconds the chair rose in the air to a height of five feet. Shah pulled on its legs; it descended but rose again when he let go. He pulled it down again and sat on it; he rose into the air with it. Later, all the furniture in the place was caused to float in the air. When Shah asked the magician to bring flowers from the garden, they miraculously appeared. When he asked the magician to describe the contents of the next two letters that he would receive, he did so correctly. He was asked to materialise a rifle belonging to a neighbour who lived five miles away. The gun appeared:

The following morning, while I was having breakfast, the owner of the rifle came to collect it. At the time, I was almost too confused to think. He claimed that he had dreamed the previous night that I had borrowed it. In England two years later... we again compared notes, and my friend agreed that the event had actually taken place. What was I to think? The magician never asked for any payment or reward, and I never gave him any. He came, as he said, ‘to demonstrate the powers that come to a man who genuinely follows the path of virtue’

... This experience is representative of a large number of experiments which I and various other students of Indian occult lore conducted during a period of some three months. Certain broad outlines of magical practice among the Sadhus emerged from this study.

— *Idries Shah* ¹¹²

All this looks like fiction. But similar encounters with magicians, in Egypt and in India, are to be found in the works of Paul Brunton, and in an earlier era Louis Jacolliot,¹¹³ Chief Justice of Chandernagore for seven years in the 1860s, devoted much of his time to the investigation of ‘miracles’ performed by holy men. His book holds a plethora of wondrous tales. Of course, reports of this kind, alleged to be true by a single witness, can hardly be adduced as hard evidence. As a Chief Justice, Jacolliot should surely have realised this for himself. Nevertheless, his accounts have a certain fascination:

I asked the fakir if any particular place was preferable. He answered that it was immaterial, and we went out on to the terrace, which was lighter than the room and more suitable for observations... I now urged Govinda-Swami to begin. He stretched out his hands towards a monstrous bronze vase, that was filled with water and weighed many pounds, and within five minutes it began to move and approached the fakir at a slow and regular rate. As it came nearer it gave out loud metallic sounds as if someone were striking it with an iron bar, and sometimes the sound came as thick and fast as a hailstorm. I asked for the vase to stand still, move further, and stand still again, and it happened according to my orders. I then requested that the metallic tones should sound after exactly ten seconds, and convinced myself with the aid of my pocket watch of the precision of the phenomenon. Also successful was my suggestion that the sound should follow the rhythm of a musical-box, that I had wound up for the purpose. In short, I left out nothing to gain conviction that Govinda-Swami had complete mastery over the manifestations of the strange power — three times the enormously heavy vase lifted itself a few inches above the ground and fell back silently — and the water in it was never disturbed, however much the vase shook. All in bright sunlight!¹¹⁴

On another occasion described by Jacolliot, Govinda-Swami caused a phosphorescent cloud to form in the middle of the room:

...with great rapidity, what looked like human hands projected from it. After a few minutes these hands became less vapourous, and clearer. Many were luminous and transparent, so that one could see objects through them; others were denser, and cast shadows, like ordinary material things. I counted sixteen of them. I wanted to ask the fakir if I could touch the hands; one of them separated itself and touched my outstretched finger — it was small and soft, like that of a young woman. These apparitions lasted almost two hours; one hand picked flowers and threw them to me; another wandered over my face; yet another wrote sentences on the wall that glowed for a moment and then disappeared.¹¹⁵

What are we to think?

Poltergeists

The term ‘poltergeist’ means literally ‘noisy ghost’. It was used by Martin Luther to refer to manifestations that he himself witnessed. The word fell out of use in Germany, being replaced by ‘Spuk’, but continues in English as a label for a type of phenomenon that manifests itself in all ages and all cultures.¹¹⁶

Typical manifestations of the poltergeist phenomenon are as follows:

There are mysterious bangings or knockings with no discernible physical cause. Objects are displaced or ‘thrown’, or, less usually, even seen to materialise out of thin air. Frequently, displaced objects do not follow normal trajectories but behave as if transported by invisible agencies. The manifestations give an impression of being under intelligent control, but the ‘intelligence’ is of a low order characterised by childish mischievousness. Modern investigators have usually found some social tension in the relationships of the persons around which the poltergeist effects occur; often there is a disturbed or frustrated child or adolescent present. The modern view of parapsychologists is that the psyche of this individual, referred to as the ‘poltergeist focus’, is an integral part of the paranormal process taking place.

Poltergeist activity is not an extremely rare phenomenon. Between 1925 and 1950 the French police investigated several hundred

cases.¹¹⁷ Since 1945 the Freiburg Psychological Institute has investigated dozens of similar manifestations in Germany.¹¹⁸ In the 1970s Alan Gauld, a psychologist at the University of Nottingham, made a survey and computer analysis of 500 cases.¹¹⁹

One of the earliest well-documented cases took place in 1661, and became known as the ‘demon drummer of Tedworth’.¹²⁰ A vagrant drummer had been causing a nuisance with his noise. A magistrate, John Mompesson, brought him before a Justice of the Peace: the drum was confiscated and stored in Mompesson’s house. Violent disturbances then broke out in the house: loud knockings and thumpings, and the beating of an invisible drum. Articles flew about the rooms, and the bedsteads — particularly those of the younger children — were violently shaken. Occasionally, the beds of the servants, with the servants in them, would rise up from the floor and gently descend. Mompesson reported that ‘in our presence and sight the chairs would walk about.’ One night he spread ash over the floor of one of the ‘haunted’ rooms and reported on the impressions found in the ash in the morning: ‘...in one place, a great claw, in another a lesser; some letters in another they could not make out, besides many circles and scratches in the ashes.’ When the news of the disturbances had spread, the Reverend Joseph Glanvill, a Fellow of the Royal Society, was sent to investigate. He witnessed loud scratching noises that could not be accounted for, found that ‘the demon’ imitated noises he made, and panted like a dog so loudly that the room shook. A linen bag hanging in the room moved as if something living were inside it — he found it to be empty. Visitors to the Mompesson house who failed to witness any of the effects usually went away unconvinced. Glanvill commented that they were like the Spaniard who, after spending a few weeks in England without seeing the sun, goes home and claims that there is no sun in England.

Charges of fraud were later brought against Mompesson, which were vigorously denied by him and by Glanvill. Mompesson was a man of integrity, a magistrate and a respected member of the community; there was no conceivable motive for perpetrating a hoax.

Glanvill was, surely, one of the first objective scientific investigators of paranormal events.

In 1850 a poltergeist outbreak occurred in the rectory at Stanford, Connecticut, the home of the Reverend Elakim Phelps. One visitor described how he witnessed: “the contents of the pantry were emptied into the kitchen, bags of salt, tinware and heavier culinary articles were then thrown in a promiscuous heap on the floor.” Chairs moved around “unimpaired by any visible agency”, heavy marble-

topped tables reared up on two legs, and the large door-knocker would sound loudly when no-one was at the door. The Rev. Phelps witnessed these bizarre events 'hundreds and hundreds of times', and so did 'a score of persons of the first standing in the community.' Nevertheless, newspapers were soon claiming that the mystery had been solved: 'Phelps' children had been playing a trick.'¹²¹

An interesting case was investigated in 1958 by J.G. Pratt of Duke University and the young W.G. Roll (later to become America's leading poltergeist investigator). The occurrences had been taking place in the Long Island house of James Hermann, an airline executive. The family kept hearing bottles 'popping' in vacant rooms and, when they investigated, finding that the tops were unscrewed and the contents — shampoo, bleach, wine, etc. — spilled. After a week of this, Hermann called the police, who first suspected the children — a girl of 13 and a boy of 12 — but found that the children were often in one room when bottles opened and spilled in another room. When Rhine heard of the mystery he sent Pratt, his most trusted assistant, to investigate. Hermann described to Pratt and Roll how he himself witnessed two bottles moving along a table, one of them falling in the sink and the other crashing to the floor. While Pratt and Roll were in the house — they stayed for ten days — bottles continued to pop and crash in unoccupied rooms. Though this happened only when the twelve year old son was in or near the house, Pratt and Roll convinced themselves that neither he nor his sister were anywhere near the affected bottles. They claimed to have ruled out any possibility of a family hoax — there was no motivation anyway. The phenomenon ceased soon after the visit of Pratt and Roll.¹²²

The bombardment of a house by stones is common in poltergeist cases, as was noticed for example by Tizané in his survey.¹²³ The earliest recorded instance is of a rain of gravel on a house in Bingen in 858 AD.¹²⁴ It is interesting to speculate that many instances of mysterious bombardments of stones of the kind noted by Fort might be related to poltergeist activity. Many other instances are described by Janet and Colin Bord.¹²⁵ For example, Fort gives an account of stones that, for four months in 1922, had been falling intermittently from the sky, always on the roofs of two adjacent warehouses in the small town of Chico, California. They were witnessed by crowds of townspeople and curiosity-seekers from out of town. Various accounts refer to 'a downpour of oval-shaped stones', 'a shower of warm rocks', etc. One of the stones weighed 16 ounces. On 17 March 1922 a 'deluge' of rocks fell on a crowd that had gathered, and a person was injured. Fort

quotes the eye-witness account of a woman who was visiting Chico during the phenomenon:

While I was discussing it with some bystanders, I looked up at the cloudless sky, and suddenly saw a rock falling straight down, as if becoming visible when it came near enough. This rock struck the roof with a thud, and bounced off on the track beside the warehouse, and I could not find it. I learned that the rocks had been falling since July 1921, though no publicity arose until November.¹²⁶

One of the most remarkable accounts of poltergeist activity has been provided by Michael Talbot,¹²⁷ who claims that he was himself the ‘focus’ of the phenomenon, which began when he was six and continued into his mid-twenties — an exceptionally long ‘life’ for a poltergeist. Also unusual is that he appears to have been a fairly happy child; the emotional maladjustment that investigators have come to expect in a poltergeist focus is absent. The earliest manifestations in this account are showers of gravel falling on the roof of the house; sometimes so much that it had to be swept up in the morning. The Talbot house was fairly isolated in the Michigan woods; Talbot tells us that gravel used to fall on the heads of himself and his friends as they walked through the woods in the evening.

Talbot’s account is totally ‘anecdotal’; anyone who reads it is free to believe he just made it up. In a debunking review of Talbot’s book,¹²⁸ Harry Eagar, the editor of *Business Record* in Des Moines, is in no doubt that this poltergeist is fictitious. Since Talbot provides no corroborative statements by independent witnesses but expects us to take everything on trust, we simply have no way of judging. The weird happenings described by Talbot are not untypical of the many hundreds of better-authenticated poltergeist cases. Perhaps more interesting is Eagar’s remark that Talbot’s book ‘is very well and plausibly written and so rather harder to dismiss or refute by simple jeering.’ As an insight into the debunking mentality that masquerades as ‘sceptical’, this is very revealing. I find the notion of ‘jeering’ as an accepted method of dismissing evidence or refuting argument quite extraordinary.

The Rosenheim case is perhaps the most thoroughly authenticated poltergeist case on record.¹²⁹ It provides the most convincing evidence to date of the objective reality of paranormal phenomena. In November 1967 reports began to appear in the newspapers of inexplicable events in a lawyers’ office in Rosenheim,

Bavaria. Electric lightbulbs kept exploding, fluorescent tubes on a ceiling 2.5 metres high kept going out — electricians found them unaccountably unscrewed from their sockets. Sharp bangs were heard, and fuses blew for no apparent reason. Fluid in the photocopying machines spilled out. The telephone system became totally erratic; four telephones often rang simultaneously, conversations kept being cut off, and the telephone bills soared. The normal work of the office was severely disrupted.

The maintenance department of the local power station and the post-office engineers responsible for maintaining the telephone system moved in to investigate. Their monitoring devices registered large deviations that were often simultaneous with the abnormal occurrences. The post office engineers found relays operating as if the number 0119 (the number for the speaking clock) were repeatedly being dialled from the office, sometimes as frequently as six times in a minute, though no-one was making any such calls. This persisted for weeks. When the office was isolated from the mains electricity supply and supplied with its own generator the electrical anomalies continued unabated.

Television programmes about these strange events were made and broadcast. They show the destruction in the lawyers' office, the complaining lawyers, the baffled statements of the engineers and technicians, and a haughty post-office official claiming the infallibility of his organisation and asserting that someone in the office *must* be making the 0119 calls.

The Freiburg Institute began its investigation on 1 December. They revealed that the disturbances only took place during office hours and that the inexplicable deflections of the monitoring equipment began precisely with the arrival of Annemarie Schaberl, a 19-year-old employee. She was a country girl who had had a strict upbringing by an authoritarian father; she hated working in an office. When she walked along the corridors the lamps behind her began to swing with increasing amplitude. When light bulbs exploded the fragments were observed to fly towards her. It became clear to the investigators that Annemarie was the 'focus' of the anomalous events.

Two physicists from the Max Planck Institute in Munich thoroughly examined and tested the monitoring equipment. Their conclusions included the following statement:

In the course of this investigation we came to the conclusion that it cannot be explained by means of today's theoretical physics. On the other hand we ascertained its existence by

means of the same experimental physics. I cannot offer any model which seems to fit these phenomena. That they really do exist could be established with the utmost certainty.¹³⁰

During the investigation the phenomena intensified. Pictures on the wall were seen to swing and even to turn around to face the wall; the investigating team succeeded in recording this on film. Many of the investigators witnessed drawers coming out by themselves. On two occasions a filing cabinet weighing 175 kilograms moved 30 centimetres from its position against the wall. Throughout the investigations Annemarie, who had not been told that she was the suspected 'focus', became increasingly nervous, eventually showing hysterical symptoms. When she was sent on leave the disturbances ceased abruptly. She left the office for a new position. Some similar anomalous events took place in the mill where she then worked, but they were less dramatic and her new employers were reluctant to discuss them. All anomalous occurrences surrounding Annemarie ceased finally when she married.

The Rosenheim case involved about forty first-hand witnesses who were thoroughly interrogated, among them technicians, the criminal police (lawyer Adam had placed an accusation against the unknown), physicists, journalists, clients of the office, whose testimonies could be compared with our own observations. The final result of the investigation was broadcast by West German Television. The controlled publicity of the case, the shift from a misleading technical interpretation to the psychokinetic evidence which could be followed up by millions of spectators led to the breakthrough in public opinion.

— *Hans Bender*¹³¹

It is rather amusing to compare the dramatic and bewildering manifestations in well-documented cases such as this with attempts to debunk the poltergeist phenomenon. Rawcliffe's 'rational explanation' of poltergeists is reproduced in full below:

Once a person has come under the influence of supernatural beliefs his mind ceases to function at its normal level of reasoning; the simplest things may take on the appearance of mystifying enigmas. Nowhere is this better illustrated than in poltergeist hauntings. Once the belief in the presence of a

poltergeist exists, any odd noise or unusual accident will be attributed to the agency of the 'playful spirit'.

Poltergeist traditions occur in all parts of the world. And the 'phenomena' are strikingly similar. In many primitive societies it takes the form of 'stone throwing'. In Europe and America it almost invariably manifests itself in connection with one person in the household — usually a young adolescent. Spiritualists say that such adolescents are 'psychic', that they 'attract' the poltergeist which cannot 'manifest' itself without their presence. The truth, of course, is that the adolescent girl or boy is solely responsible for the production of the poltergeist phenomena; in almost every case that has been completely investigated, the poltergeist activity has ended in the child being caught red-handed in trickery. Such children are usually maladjusted. Sometimes they have physical abnormalities; they find in poltergeist trickery an outlet for thwarted instinct. The skill with which, after a few weeks of practice, the child produces the 'phenomena' is often extraordinary.

In the case of elderly people who complain of being pricked, poked or tickled by persecuting poltergeists the phenomena are usually attributable to neurotic delusions, or in some cases tactile hallucinations due to incipient psychosis. It has also been suggested that certain poltergeist phenomena such as mysterious knocks, tappings, thumpings, tickings, buzzings, rumblings and hissings may sometimes have their origin in the not uncommon complaint called *tinnitus* — hallucinatory noises caused by inflammation of the middle ear. Such noises may appear to the percipient to reach him from outside sources.

— D. H. Rawcliffe¹³²

Miraculous Visions

Throughout history there have been numerous well-documented cases of hallucinatory experiences of a quite extraordinary nature. The control of the imagery in these cases has a deep religious significance for the percipient, and the experience is pervaded by a numinous ambience akin to that of mystical states — a sense of awe and a feeling of being in the presence of some transcendent reality. What distinguishes this phenomenon from hallucinatory experience and mystical states of the more usual kind is that in many well-documented

cases there has been *more than one percipient*. In some instances there have been dozens, or even hundreds; there have been a few famous occurrences when *thousands* have simultaneously witnessed the same miraculous visions. In these events, the distinction we normally make between purely *subjective* — ‘imaginary’ — experience and the perception of *objective* reality becomes blurred.

When Jung put forward the concept of a ‘collective unconscious’ he was referring to the inheritance of psychological characteristics — a similarity of psychic structure and function to be accounted for simply by the fact that we all belong to the same species. In his later writings, a more radical departure from conventional ‘scientific’ thinking is discernible. With increasing knowledge based on experience and empirical observation he came more and more to regard the collective unconscious and its archetypal contents as belonging to a level of psychic reality beyond individual separateness — a *transpersonal* psychic substratum. It is conceivable that some such hypothesis is indispensable if any real understanding of the broad range of phenomena designated as ‘paranormal’ is ever to be attained.

Reports of visionary experiences are abundant in Catholic cultures; the traditions of Catholicism provide a psychic atmosphere that seems to be particularly fertile ground for the mysterious processes that give rise to these paranormal occurrences, as well as paranormal events in general. This is all the more remarkable in view of the fact that the authorities of the Catholic church take a generally sceptical stance, being reluctant to accept anything as ‘genuinely miraculous’ — whatever that means — and even actually attempting to discredit evidence until lengthy investigation forces them to the conclusion that something more than superstition and gullibility is involved.¹³³

Sometimes a visionary experience presages a whole sequence of miraculous events. The most famous example is surely that of the young girl Bernadette Soubirou. In 1859 she saw visions of the Virgin Mary at Lourdes, on eighteen occasions. The apparition spoke to her, calling herself ‘the Immaculate Conception’. The grotto in which the visions occurred became a pilgrimage centre. In the first year, over a hundred ‘miraculous cures’ took place at the grotto. Since 1866 the cures, testified by a panel of competent medical practitioners to be ‘inexplicable’, have been published in the *Journal de la Grotte*. At present, Lourdes is visited by five million pilgrims each year; each year there are about thirty miraculous cures.¹³⁴

Even stranger but less well known are the events that took place at Knock, a village in Ireland, in 1852. This was a case of ‘collective hallucination’. The witnesses saw luminous beings standing

against the wall of the church; one of them was the Virgin and another was identified to be St. John.

[The Virgin] held her hands extended apart and upward, in a position that none of the witnesses could have previously seen in any statue or picture.

Three witnesses noticed that her feet were bare. One woman was so carried away by the sight that she went up to the apparitions and tried to embrace the virgin's feet:

I felt nothing in the embrace but the wall, yet the figures appeared so full and so lifelike that I could not understand it and wondered why my hands could not feel what was so plain and so distinct to my sight.

Though it was raining heavily, the same witness reported:

I felt the ground carefully with my hands, and it was perfectly dry. The wind was blowing from the south, right against the gable, but no rain fell on that portion of the gable where the figures were.

St. John stood at an angle to the other figures. He was dressed as a bishop and held a large book in his left hand. The fingers of his right hand were raised in a gesture of teaching. One of the witnesses went close enough to see that there were printed words on the pages. The strength of scepticism is illustrated by the fact that the parish priest, when told what was occurring, said it might be a reflection from the stained glass windows of the church, and wouldn't take the trouble to go out and look. The phenomenon lasted for several hours. The witnesses all drifted away, soaked in rain, before midnight. In the morning nothing remained of the vision.

Ten days after the incident, a deaf child was cured and a man born blind regained his sight after a pilgrimage to Knock. Soon seven or eight miraculous cures were being reported each week. Local papers were asked by the church authorities to refrain from giving publicity to the events at Knock, and anti-Catholic papers printed derisive articles about them.¹³⁵

Erich von Däniken's book *Miracles of the Gods*¹³⁶ is a fascinating survey of the phenomenon of visionary experience. Däniken devoted ten years to the collection of reports throughout the ages, and

throughout Europe. In an appendix he lists over 200 instances. Most of them are apparitions of Christian saints; the Virgin Mary predominates. The influence on the details of the visions, of the cultural background and religious beliefs of the percipients, is apparent. But any idea that these are 'ordinary' hallucinations is contradicted by the many cases in which there were several percipients. Take, for instance, the visionary experience of four little girls of Carabandal, Spain, in 1961:

The children made quite independent statements in which all the facts tally completely. They also contain a description of the Virgin which varied little on other occasions. She had long dark brown hair parted in the middle, a longish face with a narrow nose and soft lips, a snow-white dress with a light blue cloak over it and she wore a crown with gold stars on it. Her age was between seventeen and eighteen. As in other cases, the girls noticed that the figure did not move her feet when she changed position — she floated through the air. To the right of the Blessed Virgin they could make out a 'reddish flickering image', from which rose a triangle with an inscription they could not decipher. The angels wore smooth blue robes. They too had narrow faces and dark ('black') eyes. Their fingernails were cut short — the children's observations were as accurate as that! — and large pinkish-red wings grew from their backs.¹³⁷

A noticeable common feature of many of the examples given by Däniken is that the vision appears first to a small group of children, and only becomes visible to adults later, after the occurrence has been repeated several times. For example, several visions of Mary as 'our Lady of Sorrows' appeared first to Marcelina Barossa, aged ten, and later to several adults (1945); Mary appeared first to four children, then to many villagers, in a cave at Marta near Viterbo, Italy (1948); O.Lavoisier, aged ten, and later fifty adults, saw Mary in a blue robe with a white veil, in a cave near Calais (1953).

A spectacular and famous 'collective hallucination' is the 'solar miracle' of Fatima. On 13 May 1917, after an anomalous flash of lightning, three shepherd children of Fatima, Portugal, saw Mary in a gleaming white robe, wearing a brilliant crown of roses, floating above an oak tree. Similar visions kept appearing to the same three children, regularly on the 13th of each month. The vision called herself 'The Divine Mother of the Rosary' and kept urging the children to build a church on the site of the vision. News of the visions spread throughout

Portugal — by October it had become the main news item in the national newspapers. On 13 October *seventy thousand* curiosity-seekers had descended on the small village. It was raining heavily. The clouds split open, revealing a patch of blue sky and a brightly shining sun, which began to quiver and oscillate, making movements to left and right. It then appeared to rotate at tremendous speed, shooting out cascades of green, red and violet rays, bathing the landscape in an unearthly light. According to the reports, this ‘solar miracle’ was witnessed by ten thousand people. It lasted for twelve minutes and was visible over a radius of twenty-five miles. Since 1917, miraculous cures have taken place at Fatima, as at Lourdes; they are regularly reported in a periodical, *Children of Fatima*.¹³⁸

It is rather surprising that such a bizarre sequence of events is not unique. From October 1949 to October 1950 first four, and later seven, little girls of Heroldsbach, Bavaria, saw visions of Mary in a blue mantle and a golden crown, sometimes surrounded by angels; eventually, close to three hundred adults had also seen these visions. A ‘solar miracle’ occurred, followed by miraculous cures. In 1950 Pina Milia, aged twelve, saw Mary in a white robe and sparkling diadem at Casaliccio, Italy. Subsequently, at Casaliccio and near by Aquaviva thousands saw the clouds opening, and within the opening a bright star and a shining sun that radiated ‘every conceivable colour’. In 1961, at Carabandal, Spain, four little girls saw visions of Mary with archangels repeatedly over a period of several weeks; the ‘solar miracle’ phenomenon occurred again. Again, miraculous cures followed. The solar miracle of Heroldsbach occurred on 8 December 1949 and was seen by *ten thousand* people. According to the testimony of the parish priest Gailer,

The sun came towards us, making a loud cracking noise. I saw a crown of roses five inches wide [sic!] inside it. Antonia Samm saw the blessed virgin and child inside the sun. There were five of us priests up on the hill. I shall testify to this as long as I live.

Dr. J.B. Walz, a professor of theology, made the following statement:

It grew lighter and lighter and more dazzling. The sun seemed to become more blinding and bigger and to be coming nearer to us. I felt blinded. I had the overwhelming impression of something quite abnormal and also felt that something awful was going to happen at any minute. I was terrified... Then the

sun began to turn very quickly on its own axis and the rotations were so clearly visible that it seemed as if a motor was turning the sun's disc at a regular speed. During this process it took on the most wonderful colours.¹³⁹

The examples mentioned above illustrate some of the manifestations of the phenomenon of visionary experience, as they occur in the context of the belief systems of Catholicism. The phenomenon manifests itself in various social contexts; what they have in common is a devoutly religious psychological 'atmosphere'. The details of the imagery vary accordingly. Lama Anagarika Govinda, a Tibetan Buddhist of German origin, described several of his own personal visionary experiences. He also described a historical example that is remarkable for the intricacy, detail and vividness of the visual imagery, and the large number of percipients. As already mentioned in connection with the writings of Alexandra David-Neel, the importance of visual imagery as a component of 'reality' is particularly stressed in Tibetan Buddhist tradition, which grew out of a unification of Buddhist doctrine and the older Shamanic tradition known as 'Bon':

The vision was first seen by Tomo Geshe Rimpoche alone. He made the vision visible to all who were present. Not all of them were able to see all of it. It varied according to the capacity or receptivity of the individual mind... After the party returned, each of the eyewitnesses described what he had seen, and a painting was conscientiously executed. One of the last witnesses of this memorable incident is the present abbot of Dzungka Gompa, who gave permission to take photographs and pointed out what he had seen with his own eyes, and what apparently had been visible to others. He also mentioned the strange fact that the vision had remained visible for hours, so that all who saw it could observe and point out to each other the minutest details.

Govinda chooses to convey his impression of the painting, and the abbot's recollections, by quoting from the Suranga Sutra a description of a similar event said to have taken place in the presence of the Buddha Sakyamuni:

The blessed Lord, sitting upon the throne in the midst of Buddhas and Bodhisattvas... From his hands and feet and body radiated supernal beams of light that rested upon the crown of

each Buddha and Bodhisattva. And equally from the hands and feet and bodies of each Buddha and Bodhisattva went forth rays of glorious brightness that converged on the crown of the Lord Buddha... All the intersecting rays of brightness were like a net of splendour, set with jewels and overarching them all. Such a marvellous sight had never been imagined and held all who were present in silence and awe.¹⁴⁰

UFOs

In 1947 the pilot Kenneth Arnold observed a formation of nine bright objects, flying at ‘incredible speed’ at 10,000 feet with an undulating motion ‘like a saucer skipping over water.’ This seems to have been the beginning of a spate of reports of sightings, often by highly credible witnesses and sometimes by multiple witnesses, of strange and unaccountable objects in the sky.

In 1948 Dr. J. Allen Hynek, an astronomy professor, was called in as a scientific investigator by the United States Airforce, to participate in their ‘Project Blue Book’, a project set up, ostensibly, for the investigation of the ‘flying saucer’ phenomenon. Initially a hard-line sceptic, Hynek rapidly came to recognise that the project was essentially a debunking exercise: its methods bore no resemblance to those of serious scientific investigation — the whole thing was a fiasco.¹⁴¹ Nevertheless, he stayed with the project for twenty years, since this was the only way of maintaining access to the data that continued to pour in. When the project ended in 1969, he set up the ‘centre for UFO Studies’ (CUFOS), the first organisation for the serious scientific investigation of this very puzzling phenomenon.

To anyone who takes the trouble to study the serious literature on the topic, it is abundantly evident that pseudo-scientific explanations based on the ‘misperception’ or ‘delusion’ hypothesis, of the kind indulged in by Project Blue Book — and at the present time by Philip Klass¹⁴² —, though applicable to a large number of the simpler cases, are grotesquely inadequate as a response to the stranger aspects of the phenomenon. There is far more to ‘the UFO phenomenon’ than misinterpretations of weather balloons, aircraft, the planet Venus, and so on.

The phenomenon did not begin in 1947. Rare reports of similar sightings have existed since medieval times. For example, Jung¹⁴³ refers to strange aerial phenomena, apparently witnessed by many people, over Nuremberg in 1561 and over Basel in 1566; he reproduced two delightful contemporary illustrations. Charles Fort

found dozens of nineteenth-century reports of inexplicable objects and lights seen in the sky.¹⁴⁴

Carl Jung's book *Flying Saucers: A Modern Myth of Things Seen in the Sky*¹⁴⁵ appeared in 1958 and stands as a landmark and a classic in the literature on this topic. What distinguishes it is Jung's emphasis, not on the question of their 'reality', in an objective physical sense, but on their incontrovertible *subjective* reality, and the deeper significance of *that* reality. That is not to say that he dismissed the possibility of a physical side to the problem, but that, as a psychologist, this was not for him where the interesting questions and answers lay. In a curious conversation¹⁴⁶ ten years after the publication of the book, Lindbergh persistently attempted to draw Jung into a discussion of the physical nature of flying saucers, but met with no success — it appeared that Jung had little or no interest in this aspect.

Throughout the 1950s the reports poured in, reaching epidemic proportions. An anomalous and spectacular peak in the number of sightings took place in the summer of 1952. Exceedingly strange things are still seen in the skies, far more frequently than is generally supposed by those who take no interest in such matters. In the 1950s the newspapers were keen to publish them but now they have lost interest; that is the only difference. The literature on 'Unidentified Flying Objects' (UFOs) is immense, and easily available, so there is no point in giving lengthy selections from the data here.¹⁴⁷

Between 1981 and 1986, throughout the Hudson Valley region, over 5000 sightings took place, many of them in the presence of multiple witnesses. The object seen was always the same (or similar): a boomerang-shape decked with coloured lights. It often hovered. It was usually silent but on some occasions a 'humming sound' was reported. According to those who saw it, it was huge: 'as big as a football field'; 'A flying city'; 'I was amazed at the size of the thing. It was over 400 feet from tip to tip.' ... On July 24 1984 the UFO hovered low over the nuclear reactor plant at Indian Point and was witnessed by the security guards and several workers at the plant. The official statement: "nothing happened."¹⁴⁸

The phenomenon has gradually changed its nature over the years. Sightings of unaccountable discs and 'cigar-shaped' objects in the daytime sky and lights in the night sky gradually gave way to reports of encounters that, if taken naively at their face value, appear to be landed 'spacecraft' of a multiplicity of bizarre types, and encounters with their alien humanoid or semi-humanoid 'occupants'. The 'visitors from outer space' hypothesis seems untenable in view of the enormous variety of types of 'craft' and 'occupants' that have been reported, and

the manifest absurdity of many of them. Some sceptical writers on the phenomenon seem satisfied that they have solved the mystery surrounding the UFO phenomenon by debunking and ridiculing this 'extraterrestrial hypothesis'. But there is more to it than that. The obvious sincerity of many of the witnesses (perhaps we should say 'percipients'), who are often very frightened by their experience, rules out deliberate lying as an explanation. Sceptical commentary on the UFO mystery often attempts to argue that the phenomenon is purely psychological — there being no hard evidence for any 'objective physical reality' underlying what are essentially subjective hallucinatory experiences.¹⁴⁹ However, even if one accepts this thesis the mystery remains unclarified. Some debunkers seem to think that the problem is adequately solved and the phenomenon trivialized if you can show it to be purely subjective — as if subjective realities are somehow better understood than 'objective' physical realities. The reverse is, of course, the case. Time and time again one finds pronouncements that rest on the naive assumption that hallucinatory experiences are not 'real' and therefore uninteresting and insignificant. It is precisely *this assumption* that is called into question by the UFO phenomenon. Moreover, multiple-witness cases, and the few cases in which there is some physical 'objective' evidence that an event took place, such as depressions in the ground or earth scorched in a peculiar way where an 'alleged landing' took place, indicate that hallucinatory experience is only one component of these events.

Jenny Randles¹⁵⁰ has coined the term 'Oz factor' to denote an unusual mental state often reported by the percipients immediately before and during these anomalous experiences. It is described variously as: 'a feeling of wrongness in the air', 'an uncanny silence', 'as though I were in two worlds at once', 'I felt asleep and awake at the same time', and so on. Similar feelings are often reported in events whose underlying phenomenology appears to consist of a curious hybrid of physical and psychological reality. Neither physical science nor psychology alone seem adequate for arriving at a satisfactory understanding of these anomalous events. Perhaps what is needed and is at present lacking is an integrated *psychophysical* model of reality.

Throughout the 1970s and 1980s the increasing absurdity of the reported experiences took a new turn — a growing number of instances of individuals who have undergone the terrifying experience of 'abduction'.¹⁵¹ Details differ from case to case, but the underlying theme has a remarkably consistent pattern. Typically, the 'abductee' is levitated in a paralysed state into a uniformly-lighted womb-like room in the interior of a 'saucer' and subjected to some kind of medical

examination by alien beings. The examination may even leave physical evidence in the form of small wounds. The alien beings are of a bewildering variety of types, the most frequently reported being short, grey-skinned, goblin-like creatures with large heads and large black eyes. Commonly, *but not always*, the abductee has no conscious memory of these experiences but is alerted to the fact that something is seriously wrong by unpleasant and unaccountable physical and psychological symptoms and by the awareness of a period of 'missing time', sometimes preceded by a UFO sighting.¹⁵² Loss of memory is, of course, a well-known concomitant of traumatic experiences. The memories have often been recovered under hypnosis.

A vivid and terrifying account of an extended sequence of abduction experiences and alien encounters is the testimony of Whitley Strieber.¹⁵³ Of course, the obvious sceptical response is that Strieber is a highly imaginative type, by profession a writer of popular fantasy and horror novels, and that it is well-known that the subconscious mind can fabricate false memories under hypnosis.¹⁵⁴ However that may be, the fact remains that a very large number of ordinary, sane people have undergone some kind of experience of exceeding strangeness that has disturbed them profoundly. Their accounts are amazingly similar. Many of them show symptoms of 'post-traumatic stress disorder' (a condition brought on by terror, familiar to psychiatrists and commonly met with, for example, in soldiers who have been in combat.)¹⁵⁵

Jacques Vallée¹⁵⁶ was an astrophysicist and computer scientist and a younger friend and colleague of Professor Hynek. He became interested in UFO research when the director of his observatory ordered the destruction of tapes containing information from the tracking of a UFO — a scandalous example of the refusal of 'orthodox' science to consider data that doesn't fit in.¹⁵⁷ Vallée has now become a leading investigator in the field of UFO research. His 1970 book *A Passport to Magonia* surveys the history of the phenomenon and gives an in-depth study of its remarkable parallels with miraculous events recorded in myth and folklore, where we also find accounts of abductions of human beings by alien entities — called by various names: gods, angels, fairies, elves and so on. These parallels suggest that the UFO phenomenon may in fact be the current manifestation of something that has existed throughout human history and that what has changed are only its superficial aspects, that take their colouration from the human cultural setting. Vallée's approach is reminiscent of that of Jung. His emphasis on the numinous and mythic aspects of UFO phenomenology is not a dismissal of the data as a collection of 'fairy tales'. On the contrary, it is a recognition of the possibility that the phenomenon is a

genuinely ‘paranormal’ one related to (perhaps in some sense identical with) that of miraculous visionary experience, that an adequate understanding of what is going on might require a fundamental change in our implicit assumptions about the nature of reality, and that there may be something fundamentally wrong in our innate tendency to classify everything as either ‘physical’ or ‘mental’ — either ‘real’ or ‘imaginary’ — either ‘objective’ or ‘subjective’. This simplistic dichotomy, that pervades the current scientific paradigm, may be fundamentally in error when applied to ‘paranormal’ occurrences — it is conceivable that nature is more subtle than that. A recent book by Keith Thompson, *Angels and Aliens*, provokes further speculation in this direction.¹⁵⁸

No discussion of the UFO phenomenon is complete without a mention of its ‘lunatic fringe’. The topic attracts hoaxers, cranks and people holding naive beliefs.¹⁵⁹ This is the case also with other phenomena of a mysterious nature and even with some branches of well-established science. In the case of the UFO phenomenon it has taken the form of UFO-cults — quasi-religious groups characterised by belief in beings who fly around the solar system in saucers, taking a benevolent interest in humanity. These cult groups often cluster around a ‘contactee’, a charismatic person claiming to be in communication with extraterrestrial intelligences and to be their appointed intermediary for propagating their message to the planet. The ‘wisdom’ communicated is characterised by its banality and childishness.¹⁶⁰ Some contactees are clearly charlatans exploiting the most abject kind of naive gullibility; others seem to have undergone some kind of genuine visionary experience akin to spontaneous religious conversion of the kind described by William James¹⁶¹, accompanied by the eruption into consciousness of garbled subconscious contents. A remarkable example of this latter type was Orfeo Angellucci, discussed by Jung.¹⁶² Unfortunately, this fringe phenomenon has acted as a smoke-screen, bringing UFO studies into disrepute and obscuring the obvious fact that at the core of UFO mythology there genuinely exists a widespread experiential phenomenon — an enigma calling for serious study and research.

Implications

In this chapter we have dipped here and there into an enormous accumulation of data. We have been like children playing on the seashore, ‘diverting ourselves now and then finding a smoother pebble or a prettier shell than ordinary’. For every instance I have cited, there are

dozens, and in some cases hundreds, of instances of similar recorded ‘paranormal’ experiences and goodness knows how many unrecorded instances. It is an entirely inadequate response, neither rational nor scientific, to dismiss this data in its entirety by protesting that it doesn’t amount to ‘hard evidence’. Nor is it rational or scientific to assume that every particular instance of paranormal experience is a piece of nonsense to be ‘explained’ on the basis of preconceptions drawn from a narrow vision of reality — the narrow vision of ‘things that are well-understood’.

It is a fact that there are numerous strange aspects of subjective experience whose straightforward interpretation is inconsistent with the mechanistic world view. If taken at their face value they imply that there is something seriously amiss with ‘commonsense’ notions about the nature of space and time. On the other hand, if the mechanistic world view and ‘commonsense’ notions are correct, the implication is that *no* report of paranormal experience is to be accepted — every report would then require some devious explanation to account for its existence and the problem would then be a matter for psychology, without implications for the physical sciences.

The data is generated by the processes whereby human beings experience the world. The data arising from human experience is the foundation of all science. Scientific investigation is the search for a comprehensive intellectual understanding of the reality underlying what the human mind, in its encounter with the world, experiences. Science is driven by curiosity and imagination. To erect barriers to protect the purity of science from all that testifies to the anomalous nature of certain kinds of experience, to perceive these areas as a threat to science, is a thoroughly anti-scientific impulse. It is simply taking refuge in ignorance — an impulse, founded on fear of the unknown, to turn away from anything that appears to challenge cherished preconceptions.

An open-minded but healthily sceptical study of the literature of paranormal experience, with a view to attempting to see where the truth lies, rapidly reveals that the mechanistic belief calls for an enormous amount of explaining away, so much so that the explaining-away exercise eventually becomes exceedingly strained and implausible.

Isn’t it time to recognise that anomalous or ‘paranormal’ experience is not a triviality to be scorned and ‘debunked’, but a pointer to the pressing need to widen the scope of scientific thinking, to strive for a wider basis for knowledge that would incorporate a satisfactory

understanding of subjective experience in *all* its aspects? Isn't it time to stop denigrating tentative steps in this direction as 'pseudoscience'?

Notes and References

1. A quite ludicrous example of gross incompetence was revealed by James Randi:
Randi, J., The great \$110,000 dowsing challenge, *Skeptical Inquirer* 8(no.4), 1984, 329.
2. Bayerstein, B., Neuropathology and the legacy of spiritual possession, *Skeptical Inquirer* 8 (no.4), 1984, 248.
3. Sherman 1980, p.96.
4. *ibid.*, p.78.
5. *ibid.*, p.79.
6. Aram 1929, p.315; Rouhier 1927.
7. Wilson 1988, p.255.
8. *ibid.*, p.169.
9. Alexandrian, S., *Surrealist Art*, Thames & Hudson, London 1970.
10. Inglis 1988.
11. Priestley 1964.
12. Pratt 1964; Holzer 1983; Inglis 1988.
13. Barker, J.C., Premonitions of the Aberfan disaster, *J.Soc.Psychical Research* 44, 1967, 170; Holzer 1983.
14. Rawcliffe 1952.
15. Wilson 1978, p.362; Wilson 1988, p.243; etc.
16. Moberly & Jourdain 1911, Wilson 1978, p.357; Brookesmith 1984, p.37.
17. Jung 1963, p.314.
18. *ibid.*
19. Barrett & Besterman 1968; Graves 1976; Wiley 1976; Elliot 1977; Bird 1979.
20. Hitching 1977; Marsden 1983; Holzer 1983; Inglis 1985b. p.248.
21. Wilson 1978.
22. Goodman 1977; for a sceptical view see Feder, K.L., *Skeptical Inquirer*, 4 (no.4), 1980.
23. Schwarz, S.A., Deep quest, *Omni*, Mar.1979, 94.
24. Watson 1988, p.166
25. Swann 1987.
26. Watson 1987, p.246
27. *loc.cit.*, ref.22
28. Lovecraft, H.P., *Fungi from Yuggoth and Other Poems*, Ballantine, New York 1971; first published as *Collected Poems*, Arkham House, Sauk City Wis. 1963.
29. Blavatsky, H.P., *Isis Unveiled*, Theosophical Society, London & Benares 1910; Blavatsky, H.P., *The Secret Doctrine*, Theosophical Univ. Press, Calif. 1988; Guiley 1991.
30. Osty 1923; Ostrander & Schroeder 1974; Wolman 1977; Guiley 1991.

31. Goodman 1977.
32. Pollack 1964.
33. Hurkos 1962.
34. Wilson 1984.
35. Rhine, J.B. & Feather, S.R., The study of cases of psi-training in animals, *J. Parapsychol.* 26, 1962, 1; Watson 1988, p.80.
36. Watson 1986, p. 66.
37. Watson 1988, p.79.
38. *ibid.*, p.79.
39. Talamonti 1976, p.193.
40. *ibid.*, p.195.
41. *ibid.*, p.194; Michel, A., *Science et vie*, no.541, Oct.1962; Watson 1986, p.65.
42. *New Scientist* 56, 26 Oct.1972, 193.
43. Wilson 1988, p. 155.
44. Long, M.E. & Amos, J.L., Secrets of animal navigation, *National Geographic* 179 (no.6), Jul 1991, 70. For further anecdotes concerning ESP in animals see Watson 1986, chapter 5; Talamonti 1976, chapter19; Schul 1977; etc.
45. Talbot 1989, p.96.
46. Green, 1968c.
47. Muldoon & Carrington 1968.
48. Muldoon 1969.
49. Green 1968c.
50. See for example Crookall 1961; 1970; 1972.
51. Satprem 1968, p. 118.
52. Blackmore 1983.
53. Wilson 1988, p. 257.
54. Talbot 1987, p. 83.
55. Barrett 1926, 1986; Osis 1961; Moody, 1975, Watson 1987; Guiley 1991.
56. Blackmore 1993.
57. Sabom 1982; Talbot 1987.
58. Berlitz 1989, p. 80. No source reference and no date are given.
59. Watson 1974, p. 132.
60. Preface to Fisher 1985.
61. Stevenson 1974, 1980; Bannerjee 1980. Fisher 1985; Rogo 1986.
62. Bannerjee 1980; Fisher 1985.
63. Fisher 1985, p.8.
64. Gurney, Myers & Podmore 1886; Rawcliffe 1952, p. 375; Evans & Evans 1983.
65. Gurney, Myers & Podmore 1886.
66. McCrone, J., Don't forget your memory aide, *New Scientist*, 5 Feb.1994, 32.
67. Evans & Evans 1983.
68. Flammarion 1921.
69. Wilson 1988, p. 260.

70. Rhine, Louisa 1961; 1970; 1981, etc.
71. Green & McCreery 1975.
72. James 1902; 1961 edn. p. 63.
73. Elfir, A.X., The Scottish girl who came back, in Ebon 1968, p.115.
74. Newhouse, J.C., Dr. Rhine's cases; in Ebon 1968, p. 122.
75. *ibid.*
76. Flammarion 1924; Bennett 1939; Moser 1950; Thurston 1953; Ebon 1956, 1968;
Dingwall & Hall 1958; Maple 1967; Underwood 1971; McKenzie 1982;
Green, A. 1985; Spencer 1992.
77. Gurney, Myers & Podmore 1886; Tyrrell 1963; Inglis 1985; Wilson 1985; Spencer &
Spencer 1992.
78. *loc. cit.*, ref. 72.
79. McCreery 1967, 1978; Inglis 1985, p. 189.
80. Wilson 1988, p. 357.
81. Wilson 1978, p. 254.
82. *ibid.* p. 254; Inglis 1985, p. 186.
83. David-Neel 1967; Govinda 1966.
84. David-Neel 1967, 1984 edn. p. 221.
85. *ibid.* p. 218; Talamonti 1976, p.154.
86. Talamonti 1976, p. 154.
87. Quoted by David-Neel 1967.
88. Green & McCreery 1975.
89. Meyrink 1973, p. 282.
90. Meyrink G., *Fledermäuse* 1, Moewig, Rastadt 1984, p. 49.
91. Spence 1920; Wilson 1971, 1978, 1988; Inglis 1985; Jung 1977, p. 92.
92. Crookes 1874; Inglis 1985.
93. Rawcliffe 1952.
94. Home 1872; Spence 1920, p. 211; Wilson 1971; Inglis 1985.
95. Wilson 1971, p. 608.
96. Crookes, W., *Quarterly J. of Science*, Jul 1871; Crookes 1874.
97. Crookes, W., Notes on an enquiry into the phenomena called spiritual, during the
years 1870-73, *Quarterly J. of Science* 11,1874,85; quoted by Jung 1982a,
p.99.
98. Jung, C.G., On spiritual phenomena, in Jung 1982a, p. 92.
99. *ibid.*, p. 100.
100. Inglis 1985, p. 160.
101. *ibid.*, p. 159.
102. A fascinating eye-witness record by H.D. Jencken, of the events of the seance
during which this took place, is given by Spence 1920, p. 359.
103. Inglis 1985, p. 167.
104. Carrington 1909; 1910; 1954; McCreery 1969; Inglis 1985b.
105. McCreery 1969.

106. Rawcliffe 1952.
107. Inglis 1985b, p. 121.
108. Fielding, E., Bagally, W.W. & Carrington, H., Report on a series of sittings with Eusapia Palladino, *Proc. Soc. Psychical Res.* 23, 1909, 309-569; Carrington 1909, 1954; McCreery 1969; Inglis 1985b, p.122.
109. Mishlove 1975, p. 170; Owen & Sparrow 1976; Talbot 1987, p. 139; Spencer & Spencer 1992, Chapter19; Gordon 1992, p.514; Guiley 1991, p. 443.
110. Talbot 1987, p. 143.
111. Brunton 1934; 1935; Shah 1957; 1964; 1973; Jacolliot 1911, 1971.
112. Shah 1956.
113. Jacolliot 1911, 1971; Meyrink 1973; Wilson 1978, p. 574.
114. Translated from Meyrink 1973, p. 224.
115. *ibid.*, p. 227.
116. Tizané 1951; Thurston 1953; Roll 1972; Wilson 1981; Rogo 1986; Watson 1988, Chapter 7; Bord & Bord 1989, chapter 1; Inglis 1989, chapter 4; Spencer & Spencer 1992, chapter13.
117. Tizané 1951.
118. Bender, H., Modern poltergeist research, in Beloff (ed.) 1974, p. 122.
119. Gauld & Cornell 1979.
120. Spence 1920, 1988, p. 325; Inglis 1985, p. 210; Spencer & Spencer 1992, p. 291.
121. Inglis 1989, p. 214; Spencer & Spencer 1992, p. 293.
122. Pratt, J.G. & Roll, W.G., The Seaford disturbances, *J. Parapsychol.* 22, 1958, 79; Watson 1988, p. 195; Inglis 1985, p.216.
123. Tizané 1951; Watson 1988, p. 192.
124. Bender, *loc. cit.*, ref. 116.
125. Fort 1919; Fort 1923; Bord & Bord 1989, chapter 16.
126. Fort 1923, 1974, p. 218.
127. Talbot 1987.
128. Eagar, H., Bad arguments well written, *Skeptical Inquirer*, 12 (no.2), 1987, 200.
129. Bender, *loc. cit.*, ref. 118; Inglis 1985; Wilson 1978, p. 466; Watson 1988, p. 195.
130. Bender, *loc. cit.*, ref. 118.
131. *Ibid*, p. 134.
132. Rawcliffe 1952, p. 377.
133. Däniken 1977; Guiley 1991, p.343; McClure 1983; Bord & Bord 1989, chapter 15.
134. Däniken 1977, p. 103; Gordon 1992, p. 410.
135. Vallée 1985, p. 152.
136. Däniken 1977a.
137. *ibid.*, p. 26.
138. *ibid.*, p. 22.
139. *ibid.*, p. 34.
140. Govinda 1966, p. 10.
141. Koestler 1979, appendix 4; Hynek 1978; Story 1980.

142. Klass 1974; 1983.
143. Jung 1958, 1977, p. 128.
144. Fort 1923, 1974; Fort 1919, 1979, chapters 24, 25, 26.
145. Jung 1958, 1977.
146. Jung 1980, p. 364.
147. Here is a selected reading list: Bord & Bord 1989, Chapter 6; Bowen (ed.) 1969; Brookesmith (ed.) 1984; Clark 1993; Conroy 1989; Evans 1987; Fowler 1979; Hopkins 1981; 1987; Hynek, 1978; Hynek & Vallée 1975; Hynek, Imbrogno & Pratt 1987; Jung 1958, 1977; Randles 1983; 1988; 1990; Rimmer 1984; Spencer & Evans (eds.) 1988; Story 1980; Strieber 1987; 1989; Thompson 1993; Vallée 1965; 1970; 1985; Walters & Walters 1989; 1994; Wilson 1978, part 3 chapter 2.
148. Hynek *et al.* 1987.
149. Simon, A., Psychology of UFOs, *Skeptical Inquirer* 8(no.4), 1984, 355; Taves, E.H., Communion with the imagination, *ibid.* 12 (no.1), 1987, 90; Ellis, B., The varieties of alien experience, *ibid.*, 12 (no. 3), 1988, 263.
150. Randles 1990, p. 79 etc.
151. Hopkins 1981, 1988; 1987; Fowler 1980; Rimmer 1984; Thompson 1991; Mack 1994; Bryan 1996.
152. Hopkins 1988; Thompson 1991; Mack 1994; Bryan 1996.
153. Strieber 1987; 1989; Conroy 1989.
154. Alien abduction claims and standards of enquiry, *Skeptical Inquirer* 12 (no. 3), 1988, 270 — excerpts from a radio talk-show with guests Charles Gruder, Martin Orne and Budd Hopkins. See also ref. 146. Alvin Lawson chose sixteen people who were not well-acquainted with UFO lore. Under hypnosis they were asked to imagine they were inside a 'flying saucer' and to describe their 'experiences'. The invented stories were similar to those of people who had actually claimed experience of 'abduction': Lawson, A.H., Hypnosis of imaginary UFO 'abductees', *Journal of UFO Studies* 1, 1977, 8 (see also Simon, ref. 146 and Evans, H., in Spencer & Evans (eds) 1988). However, the violent emotional reactions that accompany the reliving of a traumatic experience under hypnosis, which are observed in 'genuine abductees', were absent in Lawson's subjects: Huyghe, P., Dark side of the unknown, *Omni*, Sept. 1993.
155. Huyghe, *loc. cit.*, ref. 146.
156. Vallée 1965; 1970; 1985.
157. Interview in *Omni*, Jan. 1980, p. 62.
158. Thompson 1991, 1993.
159. Curran 1985.
160. The first and most famous of the 'contactees' was George Adamski. In his first book, which became a best-seller, he claimed to have met a Venusian in the Californian desert. Adamski, G. & Leslie, D., *Flying Saucers Have Landed*,

Werner Laurie, London 1953. In two later books his claims became progressively more ridiculous.

161. James 1902, 1961.

162. Jung 1977, Epilogue, p. 153.

12 SYNCHRONICITY

Coincidence

There are few persons, even among the calmest thinkers, who have not occasionally been startled into a vague yet thrilling half-credence in the supernatural, by *coincidences* of so seemingly marvellous a character, that, as *mere* coincidences, the intellect has been unable to receive them.

— *Edgar Allan Poe* ¹

When the poet Emile Deschamps was a boy in Orléans he was given a piece of plum pudding by a Monsieur Fortgibu, who had become acquainted with this delicacy on a trip to England. Ten years later, dining in a Paris restaurant, he saw plum pudding on the menu and ordered it. Unfortunately, the last portion had been ordered by another customer; the waiter pointed him out. It was M. Fortgibu, whom Deschamps had not met since that first meeting. Many more years later, Deschamps attended a party at which something unusual was served — a plum pudding! As he was telling the other guests about the strange coincidence involving M. Fortgibu and the plum pudding, the door opened and an old man came in. It was M. Fortgibu, who was visiting an apartment in the same building and had opened the wrong door by mistake.

This strange sequence of events was first recorded by Camille Flammarion, an astronomer and a prolific writer of scientific, literary and philosophical works. It has been widely propagated² and has become a classic example of the way bizarre coincidences crop up in human life. The more common kind of coincidences, though they surprise us when they happen, have to do with trivial or even silly circumstances of daily life; they amuse us when they crop up, but are soon forgotten. The frequency of occurrence is thus likely to be much greater than we generally realise; we see only the tip of the iceberg when people tell us about their coincidental experiences or when we read the works of those rare individuals who have taken the trouble to note them down and publish them. Flammarion was such an individual.

Less trivial coincidental happenings can be quite startling in their sheer *unlikeliness* — their flagrant disregard for our intuitive

understanding of the ‘laws of chance’ — and for their aura of significance:

The writer Wilhelm von Scholz³ has collected a number of stories showing the strange ways in which lost or stolen objects come back to their owners. Among other things, he tells the story of a mother who took a photograph of her small son in the Black Forest. She left the film to be developed in Strasbourg. But, owing to the outbreak of war, she was unable to fetch it and gave it up for lost. In 1916 she bought a film in Frankfurt in order to take a photograph of her daughter, who had been born in the meantime. When the film was developed it was found to be doubly exposed. The picture underneath was the photograph she had taken of her son in 1914. The old film had not been developed and had somehow got into circulation again among the new films.⁴

A collection of 150 accounts of strange coincidences has been published by Alan Vaughan.⁵ Many of them are intriguing and some of them quite astonishing. In a newspaper article, about 1970, Arthur Koestler appealed for people to write in with their experiences of strange coincidence. He received hundreds of replies, the most striking of which were published.⁶ Colin Wilson is another author fascinated by the phenomenon. One of my favourite examples is Colin Wilson’s ‘Melchizedec experience’:

In the course of writing my article on synchronicity for the *Encyclopedia of Unsolved Mysteries* I described an example recounted by the computer expert Jacques Vallée. Vallée had become interested in a California sect called the Order of Melchizedek — named after the Biblical prophet — and was doing all he could to find information about the original Melchizedek. There proved to be very little. One day Vallée took a taxi to Los Angeles airport and asked the driver — a woman — if he could have a receipt. She handed him a receipt signed ‘M. Melchizedec’. Struck by the coincidence, Vallée wondered how many Melchizedecs there were in the Los Angeles telephone directory. The answer was, only one — his taxi driver...

When I had finished telling this story I broke off my article to take my dogs for their afternoon walk. About to leave my study, I noticed a book lying on my bed; it was one I had no

recollection of seeing before, although I had obviously purchased it for I had had it bound. It was *You Are Sentenced to Life* by W.D. Chesney, and was about the evidence for life after death. I tossed the book on to my armchair and glanced through it when I returned from my walk. At the top of the page was a heading, ORDER OF MELCHIZEDEC [followed by some information about the sect Vallée was interested in]. I have just about thirty thousand books in this house, and I doubt whether any other contains a reference to Melchizedec. But I had to stumble on this one after writing about Valée's remarkable coincidence.⁷

Seriality

The Austrian biologist Paul Kammerer began to collect coincidences in 1900, and kept up the activity until he produced a book⁸ on the subject in 1919. Kammerer's examples are records of the coincidental experiences of his friends and relatives. They are mostly of the circumstantially trivial kind. What is remarkable, and highly non-trivial, is that Kammerer found that they tend to cluster in *sequences of related coincidences*. Kammerer regarded this undeniable effect, which cannot be accounted for on the grounds of probability and causality alone, as evidence for the operation of some unknown organising principle, which he called the Law of Series (Gesetz der Serie):

A *series* manifests itself as a lawful recurrence of the same or similar things and events — a recurrence, or clustering, in time or space whereby the individual members of the sequence — as far as can be ascertained by careful analysis — are not connected by the same active cause.⁹

I shall quote just one example, chosen from the one hundred examples presented by Kammerer, to show what Kammerer means by 'seriality':

On July 28, 1915, I experienced the following progressive series: (a) my wife was reading about 'Mrs. Rohan', a character in the novel *Michael* by Hermann Bang; in the tram she saw a man who looked like her friend, Prince Joseph Rohan; in the evening Prince Rohan dropped in on us. (b) In the tram she overheard somebody asking the pseudo-Rohan whether he knew the village of Weissenbach on lake Attersee, and whether it would be a pleasant place for a holiday. When

she got out of the tram, she went to a delicatessen shop on the Naschmarkt, where the attendant asked her whether she happened to know Weissenbach on lake Attersee — he had to make a delivery by mail and did not know the correct postal address.¹⁰

The Golden Scarab

If you look at any *single* anecdote involving coincidence, in isolation, it is always possible to argue sceptically that it *could* have happened ‘just by chance’. But the excessive frequency with which certain individuals seem to encounter coincidences — there seem to be ‘coincidence-prone’ individuals — and the sheer improbability of the more spectacular instances, suggests to an unbiased mind willing to think seriously about the phenomenon that something more than chance is involved. Coincidences clearly have no *causal* explanation, but some kind of explanation seems to be called for. The problem here is that intuition seems to come into conflict with rationality; the idea of a ‘causless cause’ is a logical contradiction. The idea of something other than chance underlying coincidence looks too much like the vague superstitions that attribute events to ‘the hand of fate’. But what is ‘rationality’? Is it not simply a habit of the human mind that expects explanations of phenomena to be couched in terms of temporal cause-and-effect relationships and is therefore baffled and repelled when it meets with indications that this kind of explanation will not suffice?

The many coincidences that Carl Gustav Jung experienced led him to the conviction that some unknown psychophysical principle, rather than ‘just chance’, was necessary to account for their frequency and, more significantly, for their *meaningful* content:

What I found were ‘coincidences’ which connected so meaningfully that their ‘chance’ occurrence would be incredible.

He developed his ideas on the subject in discussions with one of the twentieth century’s most eminent theoretical physicists, Wolfgang Pauli.¹¹ They postulated an underlying inter-connectedness of psychophysical events, governed by ‘an acausal connecting principle’ that supplements the principle of causality underlying physical events. They called the principle ‘synchronicity’. Of course, giving a name to a phenomenon brings us no nearer to understanding it. At least it focused attention on the phenomenon and opened it up as a topic for serious

discussion and investigation. The classic, much-cited example of a 'synchronous event' is Jung's account of a coincidence concerning a golden scarab:

A young woman I had been treating had, at a critical moment, a dream in which she was given a golden scarab. While she was telling me this dream I sat with my back to the closed window. Suddenly I heard a noise behind me, like a gentle tapping. I turned round and saw a flying insect knocking against the window-pane from outside. I opened the window and caught the creature in the air as it flew in. It was the nearest analogy to a golden scarab that one finds in our latitudes, a scarabaeid beetle, the common rose-chaffer (*Cetonia aurata*), which contrary to its usual habits had evidently felt an urge to get into a dark room at this particular moment. I must admit that nothing like it ever happened to me before or since, and that the dream of the patient has remained unique in my experience.¹²

In ancient Egyptian mythology the golden scarab is a powerful symbol of rebirth. Jung reports that the woman who had the dream had been difficult to treat because of her rigid attitudes to life. The 'synchronistic' event triggered a change for the better — a more open-minded outlook responsive to Jung's efforts — a 'rebirth'. Thus the event was far from trivial; it illustrates what Jung is implying when he speaks of *meaningful* coincidences.

The golden scarab incident could be seen as an example of a precognitive dream; the woman's dream could be interpreted as a premonition of her subsequent experience of seeing Jung capturing the rose-chaffer. Jung would claim that this is not a different 'explanation' but a different way of looking at the same 'paranormal' event. He saw 'synchronicity' as a universal principle underlying all the varieties of ESP, and a clue to how they should be understood.¹³ He argued, for example, that the correct guesses in Rhine's experiments were 'coincidences' — but 'coincidences' coming not from chance alone but also from an unrecognised psychophysical principle — from *synchronicity*.

Chapter 2 of Jung's *Synchronicity* is an account of his attempt to provide quantifiable evidence for the synchronicity hypothesis, by a statistical analysis of astrological data. I found it unintelligible. In writing this book I have adopted a deliberate policy of open-mindedness and emphasised the necessity of avoiding prejudice and

incredulity when assessing evidence. Nevertheless, I find my own prejudices emerging strongly when confronted with *astrology*. I have to confess: the topic irritates and annoys me. My adopted strategy of reserving judgement obliges me to mention the following facts, though I do not like them: Michel and Françoise Gauquelin's statistical analyses revealed a slight but significant correlation between planetary positions at the time of birth, and chosen professions, of eminent people. Intending to debunk these anomalous results, the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP) supported a similar programme of statistical analysis. To the dismay of the committee, the results of this analysis confirmed rather than refuted the Gauquelin results. Hans Eysenck, also highly sceptical, made his own investigations, hoping to refute the Gauquelin results. Again, they were confirmed, and other correlations were revealed.¹³

Twins

In cases where circumstances have separated identical twins when they were babies, it is usual to find quite fantastic coincidences when they meet again as adults — coincidences that go far beyond what would be expected to result from their identical genetic endowment, together with the effects of chance. The phenomenon was discovered by the English social worker John Stroud, who in the 1970s managed to trace and reunite sixteen such pairs. Tim Bouchard, a psychologist at the University of Minnesota, studied the same phenomenon in America. Colin Wilson has described several of the remarkable cases revealed by the work of Stroud and Bouchard. Here is one of them:

When Jim Lewis of Lima, Ohio, was nine years old he learned that he had an identical twin who had been adopted at birth. Thirty years later he decided to see if he could find him. With the help of the courts he soon learned that his twin was called Jim Springer and lived in Dayton, Ohio. As soon as they met they discovered a string of preposterous coincidences. Both had married girls called Linda, then divorced and married girls called Betty; one had called his son James Allan, the other had called his son James Alan; both had owned dogs named Toy; both had worked part time as deputy sheriffs; both had worked for the McDonald's hamburger chain; both had been filling-station attendants; both spent their holidays at the same seaside resort in Florida and used the same beach; both drove to their holidays in a Chevrolet; both had a tree in the garden

with a white fence round it; both had basement workshops in which they build frames and furniture; both had had vasectomies; both had put on ten pounds at the same point in their teens, and lost it again; both enjoyed stockcar racing and disliked baseball.¹⁴

People who believe in the reality of ESP tend to interpret the extraordinary rapport between identical twins as having a 'paranormal' component. Peter Watson concluded from his study of identical twins¹⁵ that there is no real evidence to support such a conclusion. Susan Farber¹⁶ claimed that less than ten per cent of the separated identical twins described in the scientific literature have been *completely* separated. Some were brought up in the homes of relatives, and most were reared in similar cultural, social, and economic situations. This, together with the action of pure chance, can generate coincidences. With this in mind, Joseph Wyatt of Marshal University, Huntington, West Virginia, and three of his students set up and studied a 'control group' consisting of pairs of unrelated individuals of roughly the same age and sex, and examined the level of chance coincidence.¹⁷ It was surprisingly high. The conclusion was that any two people of roughly the same age and sex from a similar cultural environment are likely to find unusual *chance* coincidences when they compare their life histories. Wyatt's study involved 13 pairs of identical twins and 25 unrelated pairs. Here for example is the set of coincidences for one of the *unrelated* pairs:

Both are Baptist; volleyball and tennis are their favorite sports; their favorite subjects in school were English and Math (and both listed shorthand as their least favorite); both are studying nursing; and both prefer vacations at historical places.¹⁸

I suspect that this case was selected as an example because it was among the best for illustrating the point of the study. The point is well taken: when assessing the level of coincidence in the lives of separated identical twins, we should not jump to the conclusion that it is evidence of something mysterious without being aware of the roles of chance, genetic identity and cultural background in generating similarities.¹⁹ Wyatt concluded:

Researchers interested in documenting the paranormal would do well to specify the level of twin similarity that would allow plausible inferences to begin. Speculation about evidence for

astrology, ESP, and such, is premature and unwarranted until the level of twin similarity is shown to be above that contributed by genetics, environment, and the natural level of similarity between people.²⁰

On these grounds a proportion of the coincidences encountered by the Bouchard's 'Jim twins' can be discounted. But isn't it *obvious* that the 'level of coincidence' in cases like theirs — and there are other equally spectacular cases — is something totally different, qualitatively, from that revealed in Wyatt's pair of Baptists? One doesn't need to resort to statistics to establish that. It is difficult to see how to apply statistical methods correctly to this phenomenon anyway: do you give the same status — the same weighting — to 'both married girls called Linda, then divorced and married girls called Betty' that you give to 'their favorite subjects in school were English and Math'? Unfortunately the phenomenon does not lie within the range of applicability of statistical analysis. In the case of the 'Jim twins' the fact that they both put on weight in their teens and then lost it can plausibly be attributed to their identical genes, and some of the other coincidences in their case are very likely due to the factors that Wyatt draws attention to. But is it *really plausible*, and can anyone *really* believe, that these factors alone account for the facts that both were called Jim, their first wives were called Linda, their second wives were called Betty, their sons were called James Allan/Alan, and their dogs were Toy? There is an 'unlikelihood factor' in the case of the Jim twins, and other cases found by Stroud and Bouchard and described by Wilson, that is self-evident and is neither 'explained' nor invalidated by statistical analysis. Colin Wilson cites the case of separated identical twins who discovered, among other bizarre coincidences, that they had married on the same day of the same year within the same hour. In another case, one of a pair of identical twin brothers had been brought up as an orthodox Jew in America, the other had been brought up in Germany and had been a member of Hitler's Youth movement. When they finally met in 1979 they were identically dressed and had identically trimmed moustaches, and both had the peculiar habit of storing rubber bands on their wrists.²¹ In another case a woman in Dover and her identical twin sister in Wakefield, Yorkshire, had been separated at birth and were re-united by Stroud thirty-nine years later. When they met they were identically dressed, and an astonishing plethora of similarities in their life histories came to light. Among other things: both had suffered miscarriages with their first baby, and then had two boys followed by a girl; both had fallen downstairs at the age of fifteen and had weak ankles as a result;

and so on.²² A few such similarities could be dismissed as trivial chance coincidences; an accumulation of very many cannot.

Incidentally, Wyatt's remark about speculation being 'premature and unwarranted' seems to rest on an attitude one could take issue with. Its implication is that we should avoid speculation about alleged phenomena until we have *conclusive* evidence for their existence. I do not agree. Sane and reasonable speculation is the life-blood of science. It can guide us in the search for more secure evidence. Is it not possible that, when evidence has been judged to be 'insufficient', that judgement has been biased by the fact that the evidence points to something we find unacceptable because not understood? In such cases, is it not conceivable that speculation might serve to clarify by producing a basis for understanding? Once phenomena become understandable, they tend to appear more plausible, and our judgement of the quality of the evidence for them changes accordingly.

From an Occult Diary

In August 1987, my wife, Janet, and I were in a restaurant, talking about a geometrical problem connected with the maths Janet was teaching. I said I thought there might be something about it in Coxeter.²³ Later, the conversation turned to the subject of sleep, and the way the number of hours of sleep needed varied for different people. I mentioned something I had read a long time ago — I couldn't remember where: there was a famous mathematician who, when he grew old, found that he needed to sleep a little longer each night; the day after he had slept for 23 hours, he finally fell into a sleep from which he never woke. On returning home I got out Coxeter — which I hadn't looked at for several years — to look for the geometrical problem. Instead, my eye was caught as if by magic by the quotation at the top of page 141:

Abraham de Moivre... declared, shortly before his death, that it was necessary for him to sleep some ten minutes or a quarter of an hour longer each day than the preceding one. The day after he had thus reached a total of something over twenty-three hours he slept up to the limit of twenty-four hours, and then died in his sleep.²⁴

Of course, a coincidence like this makes quite an impression. It started both of us thinking about Jung and his 'synchronicity'. There was no

way of knowing that it was the prelude to a bombardment of coincidences that was about to begin; it lasted about nine days and then petered out. We kept a record of these ‘synchronous events’ Here are the most noteworthy:

23 Sep 1987

Jung’s *Psychology and the Occult* turned up in the campus bookshop. I bought it and read Jung’s account of his uncanny experiences in a haunted house.²⁵ My aroused interest in Jung and Synchronicity led me to borrow Koestler’s *The Roots of Coincidence* from the Institute library. I was surprised to find that it contains a brief summary of Jung’s haunted house experience. Koestler also, in the same book, reproduces Jung’s account of the incident involving his patient’s dream of the golden scarab.²⁶ An hour or so after reading this, Janet returned home with an old *Omni* magazine²⁷ that we had lent to a friend a few months earlier; it had just been returned. I turned to the readers’ letters page, which I had not previously read. This is what I found:

Synchronized Events

...Koestler’s book *The Roots of Coincidence*. In it I was surprised to find Carl Jung’s book *Synchronicity* discussed at great length; it also mentioned the scarab at Jung’s window. Naturally, after reading Koestler, I went on to read Jung. The following day one of my students lent me a copy of the December 1979 *Omni*. What awaited me inside? The ‘Life’ column ‘Synchronicity’... I read for the third time in as many days about the beetle flying in Jung’s window...

I was, naturally, quite startled and bemused by this intricately-structured concatenation of coincidences. Two days later:

25 Sep 1987

I looked for a while at a film poster, advertising a comedy, ‘Sherlock Holmes’ Smarter Brother’. I struggle to remember the name of Sherlock Holme’s brother, who enters into one or two or Conan Doyle’s stories: it was ‘Mycroft’. In the evening, instead of going to see the film, I settle down to read James Herbert’s *The Magic Cottage* that I bought yesterday.²⁸ The name of the villain in Herbert’s story? — Mycroft.

Three days later, a truly astonishing *sequence* began:

28 Sep 1987

I have been unpacking some books. About a dozen are scattered about on the living-room table. One is *Complementarities*, a collection of essays by I.A. Richards. Another is Charles Maturin's *Melmoth the Wanderer*.²⁹ As I am reading Richards' essay on Shelley, in which a 'Queen *Althaea*' is mentioned, Janet looks over my shoulder and says 'I've just seen that name a few minutes ago.' On the back cover of Maturin's book: 'Edited by Alethea Hayter.'

30 Sep. 1987

Janet is looking at a cookery book. She asks me to look up 'marshmallow' in the dictionary: '...Marsh growing plant (*Althaea officinalis*)...'

1 Oct 1987

Janet is reading the introduction in a book of Lafcadio Hearn's writings, and discovers that Lafcadio's wife was called *Althea*.

Janet and I still encounter quite bizarre coincidences from time to time — they seem to come in clusters — and we still record them. I shall not set them all down here for fear of becoming tedious. Many of them are quite silly and devoid of intrinsic interest; it is the way they cluster together that is striking. There has been nothing else quite comparable with the extraordinary nine days of synchronicity at the end of September '87. Here are a few examples:

11 Dec 1987

I have just finished reading 'A Marriage' by Ella D'Arcy, in *The Yellow Book*. The story is set in Sonning, Berkshire, and the two inns in Sonning are mentioned: 'There was the usual difference of opinion as to which of the two inns they should put up at, The White Hart being voted too noisy, The French Horn condemned as too Swagger.' Our friend Prasad is visiting us in Bangalore, from Holland. Janet and Prasad start reminiscing about Sonning and its two inns, The White Hart and The French Horn.

16 Feb 1988

Janet is preparing a collection of words meaning 'egg' in various languages, for a project with her students. I get out our

Chinese-English dictionary, without much hope of finding what we want among the 756 pages in Chinese-dictionary order. It opens *immediately* at page 619: ‘tan’ — egg.

3 Mar 1991

I have just read ‘The Man with a Thousand Legs’, a story by Frank Bellknap Long.³⁰ It contains this passage:

...a book that I’d been reading off and on for a week. It was a translation of the *Arabian Nights*... I was reading the first part of *The King of the Black Isles* and had reached the sentence: ‘And then the youth drew away his cloak and the Sultan perceived with horror that he was a man only to his waist, and from thence to his feet he had been changed into marble.’

A few hours later, looking for material for chapter 9 (of *this* book!) I pick up ‘Le Club des Hachichins’ by Théophile Gautier³¹, *open it at random*, and see this:

...je sentais mes extrémités se pétrifier et le marbre m’envelopper jusqu’aux hanches comme la Daphné des Tuilleries; j’étais statue jusqu’a mi-corps, ainsi que ces princes enchantés des Mille et une Nuits.

18 Jul 1994

Dining out with our old friend Tutu Bose, we talked about memories of the food of our childhood. Coincidental with Tutu and Janet’s reminiscences about jelly, a waiter brought in a large glass bowl of jelly and placed it on the sideboard right next to our table. We all burst out laughing.

Over the last few weeks, we seem to have again encountered more coincidences than usual. The way they seem to come in clusters, after very long periods with none at all, is quite pronounced. It even seems as if just *thinking about* Jung and ‘synchronicity’ sets them off! Superstition? — no, just observation. I shall conclude this section with just one more example, particularly uncanny for its apparent significance — its *meaningfulness*:

22 Jul 1994

I have just finished writing up Jung’s experience in Ravenna, for my chapter 11: the paragraph in which Jung describes how he was particularly moved by the mosaic depicting Jesus reaching out his hand to save Peter, who is sinking beneath the

waves. Having written this down, I go out for a walk, and buy a newspaper — something I rarely, if ever, do. The *Deccan Herald* I ask for is sold out, so I buy *The Times of India* instead. It contains a daily column, ‘Sacred Space’ — four quotations from the scriptures of various religions. I read the following:

And when Peter was come down out of the ship, he walked on the water, to go to Jesus. But when he saw the wind boisterous, he was afraid, and beginning to sink, he cried, saying Lord, save me. And immediately Jesus stretched forth his hand, and caught him, and said unto him, O thou of little faith, why didst thou doubt?

— St. Matthew 14, 29-31.

Discussion

What makes the topic of ‘strange coincidences’ particularly intriguing, and for the sceptical mind irritating, is the severe dilemma that rationality encounters in its attempts to understand. The explanation that coincidences are bound to crop up from time to time, ‘just by chance’, and that there is nothing more to it than that, seems at first sight eminently reasonable. In fact, to deny it seems contrary to common sense — it is well nigh impossible to imagine how independent causal chains of events could give rise to a ‘coincidence’ *except* by chance. However, when one looks more closely at the actual facts with an unbiased mind, the sheer improbable nature of the more striking examples of coincidence, and the anomalously high frequency of coincidences in general, the eminently reasonable explanation begins to look extremely implausible.

Almost all people with an addiction to reading and a wide-ranging choice of reading matter are likely to be familiar with the experience of coming across a very unusual or unfamiliar word — perhaps even remarking on it or looking it up in a dictionary — and then encountering it again very shortly afterwards, in a totally different context. Or a curious item of information might crop up twice in a short time, in different contexts. When involved in research work I have occasionally found this kind of coincidence stepping in to give a helping hand. Similarly, people with a large circle of acquaintances and an active social life are likely to encounter coincidences of a different kind (“I was just thinking I hadn’t seen so-and-so for ages, the doorbell rang and there he was” — that sort of thing). Thus, ‘coincidence-prone’

individuals are those who, by their life-styles, create opportunities for coincidences to arise. But that doesn't come near to explaining the frequency of coincidences, or the pattern in the phenomenon. I have noticed that coincidences seem to come in clusters: a quick succession of them after none have occurred for years; this clustering effect is what intrigued Kammerer and led him to his concept of 'seriality'. Sometimes it even seems as if simply thinking about 'coincidences' is somehow generating them! (Look for example at Wilson's 'Melchizedec' example, or the events that followed in quick succession a few days after I had read Koestler's *The Roots of Coincidence*). I have encountered attempts to explain away these observations on the grounds that coincidences happen all the time just by chance, but that there are periods when the mind is more alert to them and notices them more. As a 'sceptical explanation' I find this completely absurd; the hypothesis that coincidences are merely chance events is already strained beyond plausibility by coincidences that *are* noticed.

A characteristic of coincidences is that they are surprising — they are events that are inconsistent with our expectations. But, of course, not every surprising or unexpected event is a 'coincidence'. What, then, *is* a coincidence? A coincidence arises when the mind of an observer recognises the same pattern of meaning in two causally unrelated events. The mind is an interpreter of events — it does not receive events passively like a recording apparatus but continually recognises relationships between current perceptions and past experiences, so that every perception arouses a resonance of associations that imbue it with meaning. Some meaningful associations naturally arise frequently, others rarely. Consequently, psychic activity gives rise to a pattern of expectations. Intrinsic to this pattern is our intuitive sense of the *probability of recurrence* of meaningful associations. A 'coincidence' is a recurrence that violates our intuitive sense of probability. A coincidence is thus apprehended as an incongruity — it may be mildly surprising, or astonishing, according to the degree of incongruity. The incongruity may be felt because of the unreasonably short time that elapses between two meaningfully but not causally related events, or because of the intrinsic unlikeliness of any recurrence at all. Note that, in Deschamps' experience, ten years elapsed before the unlikely recurrence of the Fortgibu/plum-pudding association that had been formed in Deschamps' mind in his boyhood — that there was a *second* recurrence is even more astonishing! In this case, and in the case of some precognitive dreams — which Jung interpreted as manifestations of the same mysterious processes — the terms 'synchronicity' seems oddly inappropriate, suggesting as it does

an element of simultaneity. In coining the term, Jung seems to have been thinking of the psychic event that associates an experience with the memory of a previous experience.³²

This is the *subjective* aspect of coincidences; they are incongruous psychic events. However, coincidences are not ‘merely’ subjective. They arise as a result of causal sequences of events that take place ‘objectively’ in the external world. When our intuitive sense of probability is violated grossly, or repeatedly, or cumulatively, then *either* there is something seriously wrong with that intuitive sense, *or* the external events that culminate in coincidences are governed by something more than chance and causality. To decide between these alternatives convincingly, we obviously need to appeal to something more objective and quantitative than an ‘intuitive sense of probability’. That ought to be possible; there is after all an exact mathematical science of probability. The difficulty is that the phenomenon does not present us with well-posed mathematical problems; the ‘*a priori* probability’, in the strict mathematical sense, of, for instance, Deschamps’ sequence of encounters with M. Fortgibu and plum puddings would appear to be a totally meaningless concept. This kind of difficulty, of course, is what motivated Jung to resort to astrology in his attempt to establish statistical evidence that chance is supplemented by something more mysterious that he called ‘synchronicity’ — astrology provided him with *quantifiable* data.

Let us look first at the sceptical explanation that the laws of probability (i.e., the random effects of chance) are sufficient to account for all coincidences but it only *seems* otherwise because there is something seriously faulty in our intuitive grasp of probabilities. The case for this is well-illustrated by the following passage, which Hofstadter quoted from a book entitled *Psychology of the Psychic* by David Marks and Richard Kammann:

‘Koestler’s fallacy’ refers to our general inability to see that unusual events are probable in the long run... It is a simple deduction from probability theory that an event that is very improbable in a *short run* of observations becomes, nevertheless, highly probable in a *long run* of observations... we call it ‘Koestler’s fallacy’ because Arthur Koestler is the author who best illustrates it and has tried to make it into a scientific revolution. Of course, the fallacy is not unique to Koestler but is widespread in the population, because there are several biases in human perception and judgement that contribute to this fallacy.

First, we notice and remember matches, especially *oddmatches*, whenever they occur. (Because a psychic anecdote first requires a match, and, second, an oddity between the match and our beliefs, we call these stories *oddmatches*. This is equivalent to the common expression, an ‘unexplained coincidence’.) Second, we do not notice non-matches. Third, our failure to notice nonevents creates the *short run illusion* that makes the oddmatch seem improbable. Fourth, we are poor at estimating combinations of events. Fifth, we overlook the *principle of equivalent oddmatches*, that one coincidence is as good as another as far as psychic theory is concerned.³³

The authors of this passage are, clearly, fully convinced by their argument. But where is their supporting evidence? Mere assertion of a strongly-held opinion is not evidence. It may be that Koestler was misled by a fallacy, or it may be that the fallacy is in the argument of Marks and Kammann. Only an unbiased examination of the *actual data* that coincidences provide can reveal which of these two possibilities is most likely.

The coincidences of the simplest — and perhaps the commonest — type are those in which a very unusual word recurs after a very short time. A proper statistical study of these word coincidences, with a view to providing statistical evidence for or against ‘synchronicity’ would require a formidable research project, involving detailed surveys, analysis of word-frequencies, and so on. I do not think any such attempt has ever been made. However, some rough order-of-magnitude estimates of probabilities can be made.

Consider, for example, Mrs. Kammerer’s day of coincidences involving the names ‘Rohan’ and ‘Weissenbach’. The anecdote lacks information essential for a precise analysis — all such material does — but we can make some guesses that seem reasonable. Let us for the sake of argument call a name ‘rare’ (*for Mrs. K*) if Mrs. K encounters it, on average, less than once a year, and suppose she comes across some ‘rare’ name or other as frequently as once in ten days. Assume ‘Weissenbach’ is a rare name. Suppose the Kammerers have known Prince Rohan for years and that he has called on them unannounced as many as sixty times, but that the name ‘Rohan’ *in other contexts* (such as being reminded of the prince because a stranger resembled him, or reading the name ‘Rohan’ in a book) is rare. On a day on which the prince paid one of his unannounced visits, Mrs. K had encountered a coincidence involving his name, and also another unrelated coincidence

(the 'Weissenbach' coincidence). On the basis of our invented figures, the odds against this happening 'just by chance' are seven million to one. I have left out of account the curious fact that it was the man who resembled the prince who first mentioned 'Weissenbach' — thus linking two otherwise independent coincidences. It would thus seem to be a very conservative estimate to say that only about one person in a million could be expected to experience a concatenation of coincidences as unlikely as that of the anecdote, if 'chance' alone were responsible. The 'explanation' that in that case, Mrs. K must have just happened to be the one person in a million for whom something of this sort is bound to occur, is implausible when one takes account of the fact that she also 'just happened' to be married to a man writing a book about coincidences, and that *other* unlikely coincidences involving her are recorded in the book. Of course, one can adjust my fictitious figures to reduce the odds against chance, but only by making 'Rohan' and 'Weissenbach' *so very* familiar to Mrs. K that she would not have thought the incidents worth mentioning. Jung maintained that Kammerer's examples were not really due to the mysterious principle of synchronicity, but were just chance events.³⁴ That is, of course a subjective judgement based on Jung's personal intuitive sense of probability. It does not seem to be supported by Kammerer's data.

As a second exercise, let us consider my 'Mycroft coincidence' of 25 Sept. 1987. This is a clear example of the simplest and commonest kind of word coincidence. Now, *in my experience*, 'Mycroft' is a very unusual name. I have never met anyone of that name and, so far as I am aware, before the coincidence I had come across it only in the Sherlock Holmes stories. A sceptic will no doubt wish to insist that I have occasionally come across it without noticing or remembering. I don't think so, but I shall give the benefit of the doubt and suppose that it is a name I come across about once in ten years. How often do I come across a name that is this uncommon, or a word that is unfamiliar to me? Hard to say — it can't be more than half a dozen times a year and I suspect it is even less frequent. It *then* follows that in any particular year, the odds against encountering by chance a coincidence of this kind — i.e. meeting the same curiously unusual name twice in one day in unrelated contexts — are less than 600 to one. That is, among 'avid readers' — i.e. those who create the possibility of this kind of coincidence — we would expect *one* 'word coincidence' to crop up *by chance*, per 600 reader-years. This is, of course, inconsistent with observation; people who do a lot of reading seem to encounter this kind of coincidence fairly often. I know *I* do. The 'Althea' coincidence of 28 Sept. 1987 is of the same kind; I don't

recall ever having known this name before that date..³⁵ Yet it occurred only *three days* after the ‘Mycroft’ coincidence. The odds against encountering two such coincidences in any one year, within a period of ten days, are about *six million* to one. The ‘Mycroft’ coincidence was preceded, by only two days, by a much more extraordinary coincidence, and the ‘Althea’ coincidence was only the first of a rapid succession of further recurrences of this name — the odds against all this being due to chance alone become astronomical. According to the laws of probability and the hypothesis that coincidences are merely chance events, extraordinary clusters and patterns of coincidence simply should not happen.

Any single coincidence, taken in isolation, can conceivably be due to chance, but that is not the point. The question is whether the *observed frequency of occurrence* of coincidences can be due to chance *alone*. The conclusion that chance alone is *not* sufficient to account for coincidences is particularly unpalatable for the ‘rational’ mind. It feels far less ‘credible’ than such things as telepathy and clairvoyance, that sceptics and debunkers make such a fuss about. Yet the observed facts point inescapably to this conclusion. One is obliged to postulate something more than causality and chance underlying the way events organise themselves — some ‘acausal connecting principle’ that Jung called *synchronicity*. Its mysterious operation somehow takes account of the *meaning* of events, their psychological significance. Consciousness and psyche seem somehow intricately involved in the generation and intertwining of sequences of events.

Notes and References

1. Poe, E.A., *The Mystery of Marie Roget*, 1842.
2. Flammarion 1900, p. 194; Jung 1955, 1985, p. 21; Koestler 1971, p. 135; Wilson 1989, 202.
3. Scholz 1924.
4. Jung 1955, 1985, p. 21; retold in Wilson 1989, p. 198.
5. Vaughan 1980, 1989.
6. Hardy, Harvey & Koestler 1973,
7. Wilson 1989, p. 200.
8. Kammerer 1919. A review of Kammerer’s book is contained in Koestler 1971, appendix 1, p.135.
9. Kammerer 1919, p. 36; Koestler 1971, p. 137.
10. Kammerer 1919, p. 27; Koestler 1971, p. 137.
11. Jung’s *Synchronicity* was first published in a joint work: Jung & Pauli 1952, 1955. Pauli’s contribution was *The Influence of Archetypal Ideas on the Scientific Theories of Kepler*.

12. Jung 1955, 1985, p. 31.
13. Wilson 1978, p. 582; Inglis 1985, p. 260. Readers who wish to find out more about these controversial results may consult Gauquelin 1967; 1969; 1983; Eysenck & Nise 1982; *Skeptical Inquirer* 4 (no.2), 1979; 4 (no.4), 1980; 6 (no.2), 1981; 6(no.3), 1982.
14. Wilson 1989, p. 227.
15. Watson 1982.
16. Farber 1981.
17. Wyatt, W.J., Posey, Anne, Welker, W. & Seamonds, Carla, Natural levels of similarity between identical twins and between unrelated people, *Skeptical Inquirer* 9(no.1), 1984, 62.
18. *ibid.*
19. Of course, if 'believers in ESP' wanted to be really argumentative, they would point out that Wyatt has no real evidence for his claim that the level of pair-similarity in his investigation is accounted for by chance and the factors he draws attention to, and is not due to the intrusion of 'synchronicity' in his experiment!
20. Wyatt *et al.*, ref.17.
21. Identical cultural background is clearly absent in this case. We are not told how old the twins were when they were separated; could the strange habit of putting rubber bands on their wrists have been acquired while they were still together as infants?
22. Wilson 1989, p. 227.
23. Coxeter, H.S.M., *Introduction to Geometry*, Wiley, New York 1961.
24. Ball, W.W.R., *A Short Account of the History of Mathematics*, Macmillan, London 1927, p.383. Quoted by Coxeter.
25. Jung 1982a, p.146.
26. Koestler 1972, p.93.
27. Sebastian Foti, in *Omni* 2 (no.6), Mar. 1980, p.14.
28. Frank Herbert, *The Magic Cottage*, New English Library 1986.
29. I.A. Richards, *Complementarities*, Carcanet, Manchester CT 1978, p.64.
31. Baudelaire 1961, p. 62.
32. *cf.* Russell's 'Mnemic causation': Russell 1992, p. 209.
33. Hofstadter 1986, p. 100; the book by Marks & Kammann that the passage is taken from is not listed in Hofstadter's bibliography, and I have been unable to trace it.
34. Jung 1955, 1985, p.12.
35. I finished writing this section of my manuscript on 10 Aug 1994. Later the same day I relaxed by reading a story in Stephen King's *Nightmares and Dreamscapes* and encountered the name 'Althea' on p. 224.

13 SPECULATIONS AND CONJECTURES

Reductionism Revisited

We have already encountered reductionism, the technique of explaining complicated phenomena in terms of the supposedly simpler phenomena that underlie them and generate them. Thus, biological systems can be analysed by looking at the chemical processes that maintain and support them; chemical interaction can be better understood by looking at the physics of the molecules that take part in them; molecules are explained in terms of the electronic processes that bind their constituent atoms; and so on. A grand reductionist scheme emerges, in which the most complex and subtle processes of all — those associated with brains and minds — consciousness, subjective experience, volition, etc. — appear to be *explicable in principle* in terms of the elementary laws of physics. If the gaps could be bridged, we would have an explanatory scheme that steps down progressively through a hierarchy, from the complex to the less complex. The illusion is created of a world that inevitably arises, in all its complexity, from the behaviour-patterns at the lowest levels of the hierarchy, where things might be expected to be simple, readily intelligible and well-understood. A paradox of the reductionist scheme is that, when you come down to the foundations of the edifice, what you encounter is neither simple nor well-understood. You arrive, in fact, in the realm of quantum physics, a bewildering realm of conceptual problems where the deterministic principles that seemed to work at the higher levels are refuted, and where doubt is cast even on the concept of ‘objective reality’. The strangest paradox of all is perhaps the way the non-deterministic aspects of quantum theory hint at a need for some extraneous concept such as ‘consciousness’. It thus appears at least possible, and perhaps even probable, that instead of trying to ‘explain’ consciousness as a mere epiphenomenon of the behaviour of matter at the highest levels of the hierarchy of complexity, we ought rather to regard it as a particular manifestation of something basic to the fabric of reality — some crucial ingredient that reductionist and mechanistic explanatory schemes have not accounted for.

Another defect of the reductionist approach in the biological sciences is its myopia. By concentrating on ‘elementary events’ — such as genetic mutation, DNA replication, protein synthesis, etc. — conceived to be mechanical and hence deterministic, it loses sight of the most obvious characteristic of biological processes — they are

processes that organize matter in purposeful ways, at a holistic level far above that of the elementary events that constitute them. Belief in the omnipotence of ‘mechanism’ leaves its adherents with no option but to insist that the self-organising and exploratory purpose formulating activities that characterise the living world, that we see in evolution, in morphogenesis, in the behaviour of organisms, and in our own mental processes, are simply accidental consequences of a combination of blind chance and elementary mechanical events. As we have seen, there is abundant evidence that this may not be the case. Alternative possibilities remain unexplored. Indeed, they tend to be scorned as remnants of outmoded animistic superstition.

The capacity of matter to become intricately organised and to explore and exploit possibilities for further development may be not at all an accidental by-product; it may be an expression of undiscovered principles that are just as fundamental in their own right as the mechanistic principles that science has so far revealed.

The Game of Science

The fascination of scientific research is akin to the fascination of puzzle-solving. Scientists are in a situation somewhat similar to that of the players of a game, who have not been told the rules but have to work them out as they proceed.

Suppose a group of people observe a computer graphics display, knowing nothing about computers and totally unaware of how the display is generated. A game is in progress on the screen. They see images that move, change, interact. They observe regularities, they come to recognise that the changes are orderly and systematic. If they are sufficiently astute, they may develop expectations that enable them to predict, sometimes correctly and sometimes incorrectly, what will happen next. They can deduce laws obeyed by the two-dimensional ‘world’ they are observing and work out theories that account for relationships between the various laws. If they can interact with the system by means of a keyboard, their deductive ability is much increased — they can become *experimenters*. If the program generating the images occasionally goes into a rarely-encountered subroutine unexpected things might happen, so that they are momentarily disturbed because their rationally deduced laws and theories seem to be ‘violated’. However, if this happens only rarely and briefly they might tend to ignore it. They might sometimes wonder *why* the patterns are behaving the way they do. But such questions remain unanswered and unanswerable if their knowledge is restricted to what they see on the

screen, if they are never allowed — or *never allow themselves* — to think that there might be a system, operating according to its own laws and principles, generating the images. These ‘metaphysical’ questions are answerable only when our hypothetical observers recognise the truth about the patterns: there is a ‘higher’ or ‘deeper’ level of reality — the reality of the computer system, the electronic signals dancing within it, and the program that generates the patterns. They would then realise, with astonishment, that the reality behind the patterns is totally different from the reality of the world they have been observing and whose laws they have been deducing. Their deduced knowledge was not wrong, and it is not contradicted by their new and wider knowledge. They realise that what they had taken for the reality was a world of appearances — an *epiphenomenon*.

This thought-experiment, this metaphorical picture of scientific investigation, is, of course, not new. It is just an updated version of Plato’s discussion of the prisoners chained in their cave, whose knowledge is the knowledge of the shadows cast on the cave wall from the outside world, which they mistake for reality. It also has affinities with Bohm’s speculations about an ‘implicate order’.¹ The ‘explicate order’ is the world of appearances, the image-world on the computer screen; the ‘implicate order’ is the world of the program, from which the images ‘unfold’.

Analogies and metaphors are illustrative and suggestive only. I have no intention of implying that the ‘implicate order’, the underlying reality that generates the phenomenal world that we perceive, is in any sense ‘like’ a computer, or ‘like’ a computer program. All I intend is to draw attention to the fact that, in its preoccupation with the world of observable phenomena and its highly successful ventures in understanding, explaining and predicting events, scientific investigation tends to ignore indications of a deeper level of reality giving rise to that world and responsible for its existence.

Cellular Automata

The computer-game analogy is worth exploring further. Imagine a computer screen displaying a black-and-white pattern. At a small scale, we have essentially a tiling pattern of black and white square ‘tiles’ (pixels). Dynamics can be introduced into this two-dimensional world by introducing rules for changing the pattern. The pattern will then keep changing, step by step, in a strictly determined but sometimes surprising way.² ‘Cellular automata’ of this kind have been used to model natural phenomena, such as the spread of forest fires or the

changing patterns of growth and decay of competing plant species. A very simple rule, for example, might be: 'at each generation, change every white pixel to black if it is in contact along an edge with just one black pixel of the previous generation.' Beginning with a single black pixel in the centre of the screen, this dynamical rule generates a growing, branching, symmetrical pattern. This is an example of the crystal-like, growing, 'modular patterns' explored by Schrandt and Ulam.³

Different rules produce different dynamics, different sequences of change. Intricate effects can emerge from quite simple dynamical rules. Conway's 'Life' game⁴ explores the consequences of the various rules that determine the fate of each pixel by taking account of the state of the eight pixels that surround it (i.e. the dynamics has no 'action at a distance', it is a dynamics of 'local' interaction) and only of the previous generation (the dynamics has no 'memory' of the history of its development). The transformations that unfold from even such simple rules can be quite astonishing. Cellular automata of this kind are in an obvious sense analogues of the strictly deterministic world of Newtonian dynamics.

An analogue of quantum indeterminacy could be introduced — there could be two or more alternative rules, one of which would be chosen at random when deciding the fate of each pixel. The future development of the pattern is then no longer an inevitable, uniquely possible outcome of the initial pattern. Once this kind of indeterminacy has been introduced, other possible kinds of 'dynamics' suggest themselves. The 'local' rules might be supplemented by more 'holistic' rules that take account of features of larger areas of the pattern, and impose particular kinds of organisation on the pattern over the course of many generations. These supervenient organising principles would operate by influencing the otherwise random choices of elementary 'local' events. One can conceive of cellular automata that would plan ahead in the manner of chess-players, or in the manner suggested by Penrose to account for the growth of quasi-crystals.⁵ The naive observers trying to deduce the rules might well fail to recognise what is happening; they would be likely to continue to see the elementary events as random and to attribute the emergence of organised structure as the 'fortuitous' effect of the elementary local rules and 'blind chance'.

In *The Blind Watchmaker* ⁶ Richard Dawkins describes how he designed and explored a fascinating computer game. In Dawkins' program a string of symbols is translated into a graphic display — a symmetrical picture made up of a bundle of line segments. The game is

a model of Darwinian evolution. The symbol-string is a 'genetic code' and the picture it gives rise to is an 'organism' — Dawkins calls the pictures 'biomorphs'. A random change in a symbol-string corresponds to a genetic mutation, and of course it produces a corresponding change in the resulting biomorph. At each step of the program, an array of mutated 'offspring' from a single parent biomorph is displayed. Dawkins looked for something interesting in the array. One of the offspring may look vaguely like something — a butterfly, a spider, an aeroplane, a lunar module, a bat... The most interesting biomorph is selected and 'bred'; from *its* array of offspring is selected the one in which the fancied resemblance seems slightly enhanced. After many generations, Dawkins was delighted to find that, from a quite chaotic and meaningless ancestor, his biomorphs would evolve into fascinating 'quasi-biological' shapes. These experiments are presented as a model, and in some sense a vindication, of the neo-Darwinian scheme, in which Dawkins himself represents 'natural selection'. It could of course be interpreted in a quite different light. Dawkins' imagination is a crucial component in the evolution of his biomorphs, and the way it acts is very different from the action of natural selection in Darwinian theory. It is not simply eliminating the 'unfit'. It is formulating goals, and manipulating the world of the biomorphs through the freedom that its randomness offers, to achieve those goals. His imagination therefore represents not 'natural selection', but a *teleological* principle at work in the world of the biomorphs.

In the world of cellular automata, the strict determinism, and the spatial and temporal 'locality' of the dynamical rules, are analogues of the principles of Newtonian dynamics. They are obviously not logical necessities and there would be nothing 'irrational' or 'contrary to common sense' if they were relaxed. Indeed, if the strict determinism is relaxed, holistic 'non-local' organising principles can be incorporated, that supplement the local elementary laws. Similarly, in the real world, there is nothing inherently irrational in the concept of non-local holistic organising principles, supplementing the strictly local dynamics. The value of these computer analogies, I feel, is that they make this point abundantly clear. It was not clear, it seems, to those who denounced Driesch for his notion of entelechies, or Sheldrake for his notion of M-fields — whether or not Driesch or Sheldrake were right is, of course, another matter. The point also seems to be not clear to those who cannot conceive that something beyond the mechanistic principles of Newtonian physics might be needed to fully 'account for' evolution or to 'explain' consciousness and subjective experience.

On Innate Ideas

The evolution of the human psyche has been, to a large extent, a response to the problems of survival encountered by our remote ancestors. Human beings need, first and foremost, to understand the events of everyday life and to cope with the problems they present. Only when these problems are less than urgent can the human mind turn its attention to matters beyond immediate needs, such as disinterested scientific curiosity and philosophical speculation. But then, the human mind, in dealing with scientific and philosophical questions and trying to figure out how the world works and what it is all about, brings to bear the same habits and modes of thought, the same strategies, that have been honed for millennia by problems of survival and basic needs. It can do no other.

The intuitive idea of *mechanical cause-and-effect*, and the felt need to understand things in terms of this idea, are deeply ingrained characteristics of the human mind. It is not difficult to see why this should be so. The world of immediate perceptual experience constantly reinforces this innate idea. It is a world of ‘cause-and-effect through contact’. It is a world of material ‘things’ that influence each other when they come into contact: A stone lying on the ground does not move until you pick it up; when you throw it at a bird, the bird falls only when the stone makes contact with it, and stops falling only when the ground makes contact with it. The innate idea of forces arises from experiencing our own actions, such as pushing, pulling, lifting and throwing. When these innate ideas — or intuitive understandings — of the world appear to fail, the mind is baffled. When a child first plays with a magnet, the fact that it can attract metal *at a distance* seems strange and somehow magical. How can it be, that a thing can make another thing move, *without touching it*? Of course, the effect of gravity is also an action at a distance, but the utter commonplace *familiarity* of the fact that things fall when they are dropped, robs this phenomenon of much of its magic. I have already drawn attention to Galileo’s reaction to Kepler’s ‘occult’ idea that the moon might cause the tides. The predisposition of the mind to strive to understand nature in mechanistic terms lies behind the abhorrence the sceptical mind feels for ‘the paranormal’. It lies also behind the sometimes quite emotional reaction of neo-Darwinists to suggestions that their mechanistic view of the biological world might be inadequate.

The intuitive notions of mechanical causality, brought about through contact and mediated by forces, were given mathematical form and precision by Newton. The truly astounding successes of the

Newtonian scheme, its predictive power and the understanding of physical phenomena that it made possible, seemed to establish conclusively that ‘mechanistic cause-and-effect through contact’ was far more than an innate idea applicable to normal human experience — it seemed to be *the* fundamental principle behind all phenomena, and the royal road to understanding the physical world in its entirety. As Lord Kelvin remarked towards the end of this period of optimism, the test of whether you have really understood a point in physics is, ‘Can you make a mechanical model of it?’ With the introduction of the concept of physical fields, even the mysterious ‘action at a distance’ phenomena such as magnetism and gravity were incorporated into the universal mechanistic scheme. Fields are invisible entities that pervade space and can propagate mechanical causal influences, so that what had seemed like action at a distance could be understood in terms of localised mechanical action.

The *limitations* of the Newtonian mechanical world view were forced on the attention of physicists at the beginning of the twentieth century, with the discoveries that led to quantum theory. It was a hard lesson, and its impact is still disturbing. That nature at the sub-atomic level does not comply with our need to understand things in terms of ‘mechanical models’ continues to be hard for the human mind to assimilate.

Our own actions in the world are accompanied by another innate idea, one that is so intimately a part of what it is to be human that it would be more accurate to call it an inbuilt conviction, than an idea — the idea of ‘free will’. We do not feel ourselves to be a part of the inexorable, deterministic flow of mechanical events that we perceive in inanimate nature. We feel ourselves to be intervening in this flow; through our ‘voluntary’ actions, we *initiate* causal chains of events. The strength of this conviction is illustrated by a highly significant phrase that expresses the character of situations in which we *do* feel that we have got caught up in the deterministic flow: ‘we are *forced* to do things *against our will*.’

The growing confidence in the explanatory power of the mechanistic idea was not, of course, halted by the shock it received from the quantum revolution. Many physical problems of interest are not affected by the limitations that quantum physics revealed — atoms are, after all, very small. Thus, the way the brain works might still be expected to be elucidated entirely in mechanistic terms. Indeed, present knowledge of brain function would seem to support such a view. But *then* the conclusion would be that there really is *no such thing as free will* — our minds, then, would be just as mechanistic as the processes

we see in inanimate nature. On the other hand, none of our knowledge of brain mechanisms throws any light at all on a seemingly intractable puzzle: how does all the busy electrochemical activity of millions of neurons become integrated into a coherent conscious subjective experience of the world? Is it not possible that, in the phenomena of consciousness, we have *another* limitation of mechanistic thinking, as profound as the limitation that was discovered in the atomic world, and presaging a revelation as far-reaching in its own way as the revelation of quantum physics?

If even in inanimate nature the physicist comes up against absolute limits, at which strict causal connection ceases and must be replaced by statistics, we shall be prepared, in the realm of living things, and emphatically so in the processes connected with consciousness and will, to meet insurmountable barriers, where mechanistic explanation, the goal of the older natural philosophy, becomes entirely meaningless.

— *Max Born* ⁷

The Informational Universe

The fundamental constitution of the physical world, according to present knowledge, has been discussed at length in chapter 4. It has two aspects: the fields and the random transitions. As we have seen, these two aspects, which have an equal share in producing the play of events, come into conflict with ‘common sense’ notions of space and time, in a way that suggests that space and time are not so fundamental to the fabric of reality as we tend to assume. They enter into our formulations of physics as *abstractions* from the way the world presents itself to our perceptions. The physical concepts of three-dimensional space and a one-dimensional ‘flow’ of time are *extrapolations* from direct perceptual experience or, what amounts to the same thing, from innate ideas. They are characteristics of the way information about reality is organised in the psyche by the experience of living. It is interesting in this connection that in mathematical theories that attempt to unify the bewildering intricacies of ‘elementary particle’ physics, ‘space-times’ with more than the ‘usual’ four dimensions have become commonplace.

A body of information can be organised in various alternative ways; different facets of its content become salient, according to the

way it is ordered. A few simple examples will serve to illustrate this principle:

A three-dimensional holographic image is immediately intelligible to the visual cortex. The two-dimensional object, the hologram, that produces it, is not, yet the information it contains is the same. We have the same information organised according to two quite different principles. The information content of a small portion of the visual image is distributed over the whole area of the hologram, and any small portion of the hologram can produce the whole image (lacking sharpness of definition). The hologram is cited by Bohm⁸ as an analogue of his ideas about the nature of the physical world: the ‘explicate order’ — the observed world of physics as it *seems* to be — corresponds to the visual image; the ‘implicate order’ from which it ‘unfolds’ corresponds to the hologram.

The relationship between the regular arrangement of atoms in a crystal and its diffraction patterns is another example.

The mathematical reader will recognise these two examples as instances of the concept of a mathematical transform — specifically, a Fourier transform. In our presentation of quantum theory we emphasised the formulation in terms of fields in space, but the mathematical formulation of the theory quite often resorts to a different representation in terms of ‘momentum space’ rather than the familiar space of location and distance; the theory is then expressed in terms of the Fourier transforms of the fields.

A computer-graphics display presents information in a form very different from the way the same information is held in and is processed by the computer.

Finally, think of the two different ways of arranging words: in a dictionary and in a thesaurus. In the first case, the arrangement facilitates the search for a particular item of information; in the second case, the items of information are grouped according to commonality of meaning — according to what they *signify*. I feel that there is something highly suggestive in this, at first sight trivial, example. It is in a sense a metaphor for the distinction between ‘objective’ realities; subjective reality is reality organised on the basis of *meaningful associations*.

As we saw in chapter 4, the field aspect of quantum theory is not in itself in conflict with our innate ideas of space, time and mechanistic causality. The fields and their interactions obey differential equations that imply a deterministic development of configurations, brought about by local interactions — there is no ‘action at a distance’ and no violation of strict cause-and-effect relations. But the

development so envisaged is the simultaneous development of *all possible* situations — the monstrous ‘superposition of states’ of the Many Worlds picture. The aspects of quantum physics that conflict with innate notions are introduced by the *transitions* that randomly select from the many potentially possible developments. The self-consistent informational content of the physical world, carried by its ‘observables’, then seems to inhere only in the activity of the transitions. The non-local aspects of quantum physics reveal the fields themselves to be fictitious — they cannot be thought of in a consistent way as having specific configurations in space and time. Thus, if we regard the world of observable phenomena as an epiphenomenon, the result of the busy activity of the transitions, it would appear that the paradoxes of quantum theory are the result of attempting to conceive of the underlying reality as a pattern of information ordered according to our innate ideas about location in space and time. What the non-local aspects of quantum theory reveal is that reality at the most fundamental level is not ordered in this way — space and time are themselves attributes of the *observable* world; space and time are themselves epiphenomena. The activity that brings the observable world into existence from the underlying reality is asserted to be *random* — subject only to the laws of probability. However, since this activity has given rise to the living world in all its organisational complexity, the assertion that the activity *must* be random in all circumstances is open to doubt. Information seems to be being assessed in a holistic way, meaningful associations are recognised and strategies formulated. If some aspects of this activity appear to contradict our innate notions of ‘mechanism’, that may simply be because our innate ideas about space, time and matter have nothing to do with the way information is organised, at the level at which the activity operates.

Cosmic ‘Consciousness’

Throughout this book, we have been looking into various kinds of ‘phenomena’. One particular phenomenon has provided the central theme — namely, the fact that so many well-informed people hold the opinion that any evidence that appears to support ‘belief in the paranormal’ must necessarily be spurious, because such things are ‘incompatible with science.’ Often, the opinion has the strength of a conviction, leaving no room for doubt. On further investigation, it seems that ‘the paranormal’ is incompatible, not with scientific knowledge, but with a particular interpretation of that knowledge,

derived from a particular mind-set or system of metaphysical assumptions.

In this and the following sections I wish to indulge in some tenuous speculations, that provide an alternative system of metaphysical assumptions. I make no apology for entering into free and untrammelled speculation, which is an essential part of the exploratory process of science and can sometimes lead to deeper understanding and new knowledge. The ideas I shall put forward are tentative suggestions and are not to be mistaken for assertions of 'belief'. They are what the facts we have surveyed earlier seem to suggest, when they are viewed broadly as a whole rather than item by item. They do not seem to me to be in conflict with the knowledge that science has so far acquired, and their self-consistency secures them against accusations of irrationality. My hope is that they are indicative of the possibility of finding a clearer understanding of some of the anomalies that have persistently thwarted reductionist and mechanistic thinking.

Attempts to 'explain' consciousness in terms of known physical principles meet an impenetrable conceptual barrier. The rapid growth of knowledge of brain structure and function in recent years has produced a great deal of excitement, and conflicting ideas from physicists, psychologists, philosophers and neuroscientists, about how the 'question of consciousness' should be approached.⁹ The existence of journals devoted entirely to these issues, such as *Consciousness and Cognition* and the *Journal of Consciousness Studies* testifies to the long way we have come since the behaviourists sought to sweep the 'question of consciousness' out of scientific discourse.

Talk about artificial intelligence generates persuasive arguments purporting to show how intelligent behaviour and cognitive skills might in principle be simulated algorithmically — i.e. mechanistically. But the assertion that, 'therefore', algorithmic processes can awaken to conscious subjective experience, is a *non sequitur* with an air of whimsical absurdity about it. It is a *mere* assertion, devoid of any logical, rational, theoretical or empirical support. Recent discoveries of the collaborative, correlated, holistic activities of neurons, involving large regions of the brain, would seem to transcend the simplistic thinking in terms of 'algorithms' that characterised earlier speculations based on the analogy between brains and digital computers, and may have some bearing on the holistic aspects of conscious perceptual experience. But they are nonetheless processes conceived of in terms of 'materialistic' physics. One cannot see how such discoveries could lead to a better understanding of what

consciousness *is*, unless they are accompanied by some revolutionary changes in our ways of thinking about physical processes.

The central mystery remains untouched by all the speculations that have arisen, and continue to arise, from the neurosciences. These sciences continue to provide insights into the ‘mechanisms’ of memory, learning, language, and so on, but these are brain *processes* — the functional activities of the brain. These processes and functions are accompanied by consciousness, but consciousness is not itself in any sense a ‘process’ or a ‘function’. I do not see how any conceivable ‘explanation’ of consciousness as a by-product of process and function could possibly lay to rest the philosophical puzzlement that the ‘question of consciousness’ presents.. The question is how a physical system, such as a brain, can experience subjective states, how it can be aware of itself, and of what it perceives, of joys and pains, of desires and memories, and of the feeling of free will (illusory or otherwise) that accompanies its actions; this is not a question of how the brain *functions*. How can subjective awareness be abstracted and integrated from the action of millions of firing neurons? Is it not obvious that *it cannot, unless* our idea of what constitutes a ‘physical system’ is widened to include concepts we have not yet thought of?

I have hinted earlier that consciousness might be an autonomous *irreducible* ingredient of the fabric of reality rather than an artifact of mechanism.

The enigma of consciousness makes an appearance at the other end of the hierarchical structure of knowledge that science has erected as a framework for understanding the physical world. As we have seen, the quantum transitions that bring the world of objective physical reality into being are triggered by events that quantum theorists identify as ‘observations’. In attempting to clarify what kind of events these ‘observations’ might be, Wigner concluded that they are, essentially, acts of *conscious apprehension* of aspects of the physical world. It is difficult to see how this conclusion can be avoided. Attempts to avoid it by attributing ‘observation’ to large-scale events taking place in ‘measuring devices’ involve a false dichotomy, a distinction between quantum processes and classical processes — an artificial distinction that contradicts the principles of quantum theory.

If Wigner’s conclusion is accepted, the idea that consciousness is exclusively an accompaniment of brain function cannot be maintained. It leads to a quite absurd scenario in which the observation of the world by organisms with brains brings the whole universe into existence in a Berkelian manner, simply by observing it, and retro-

actively brings into existence the ten thousand million years of evolution of the universe that produced the observing organisms!

To avoid this manifest absurdity, we are forced to widen the concept of consciousness, and to postulate something akin to consciousness — a pre-consciousness or proto-consciousness, more universal, more intimately implicated in the world of physical phenomena. The consciousness of brains and minds that is the basis of subjective experience and perceptual observation would then be a particular and highly specialised manifestation of this fundamental physical agency, this proto-consciousness.

Thus, I postulate an essential ingredient of reality that by its action initiates, or triggers, the ‘transitions’, and thereby ‘produces’ the physical world. One is tempted to call this fundamental component of reality ‘consciousness’ and its action in ‘realising’ the physical world, ‘observation’. This does violence to the accepted usage of these words; but coining neologisms is also not quite satisfactory either, so I shall use the familiar words, indicating their new, extended meaning by quotation marks: ‘consciousness’ and ‘observation’.

Experimental physics demonstrates conclusively that in the inanimate world the action of ‘consciousness’ is random; the only laws it obeys are statistical laws. There is no justification for the assumption that this randomness is universal. The assumption is based on an extrapolation that established facts do not warrant, and that many puzzling aspects of life and mind appear to refute.

The hypothesis of processes underlying the ‘ordinary’ reality of sensory perception and scientific investigation, giving rise to ordinary reality, would be entirely meaningless if ordinary reality were seen to be governed by strictly deterministic laws. We know that it is not. The hypothesis would also be meaningless if the non-deterministic activity were entirely random, i.e., chaotic and meaningless. The very existence of the intricate complexities of living matter, the self-organising and purpose-seeking processes of evolution, culminating in the mysterious phenomenon of conscious minds, provides abundant — well-nigh conclusive — evidence for non-deterministic, non-random activity. To those readers who would deny this on the basis of an unshakeable faith in the omnipotence of mechanism and blind chance — if any such readers are still with me — I have only this to say: however certain our knowledge and conclusions seem to us, the truly rational, truly sceptical mind is one that never turns a deaf ear to the small inner voice that says: ‘I may be wrong’.

Our conjectural hypothesis is that, in the genesis of biological order, elementary events that are mistakenly perceived to be random

arise from the coordinated action of ‘consciousness’. ‘Consciousness’ is an organiser of matter. Rather than simply triggering random transitions, it is recognising relationships, exploring possibilities, formulating goals, and coordinating its actions. Cognition and volition would, on this view, be simply more focused, more localised, instances of much more general organising principles.

The presently dominant ‘scientific’ paradigm asserts that psychic reality is an epiphenomenon of physical reality. The reverse may in fact be nearer the truth.

I am under no illusion that these speculations are particularly original. I am also well aware that they are heretical. I suspect that they have occurred to many scientists, but that they are not publicly aired, for fear of ridicule. They are redolent of certain theological and animistic ‘superstitions’ of pre-scientific thinking, that science prides itself on having demolished. The reductionist, mechanistic style of thinking survives and flourishes only because it selects those empirical facts that support it; it turns a blind eye to those that do not, or dismisses them with simplistic debunking arguments, or it points out that they cannot be true because there is no ‘*mechanism*’ that could account for them. More imaginative ways of thinking than this will be needed if a satisfactory unification of *all* the facts at our disposal is to be achieved.

The Genesis of Meaning and Purpose

Organising principles operating in the physical world that transcend mechanistic principles can be conceptualised by appealing to an analogy with the organising activities of the psyche, and the postulated active role of consciousness in cognition and volition. If consciousness is a particular manifestation, in brains and minds, of a more general ‘consciousness’ responsible for the self-organising activity of the biological world, then this is no ‘mere’ analogy; it is an attempt to understand a general principle by examining a particular instance of it.

The purely mechanistic activity of the physical world is brought about by *local* interaction; that is to say, each elementary event is determined entirely by events contiguous with it in space and time. No wider informational context enters into the determination of physical activity — no large scale patterns of events, no ‘action at a distance’, no memory, no teleology, no entelechies, no ‘M-fields’. In a mechanistic universe, space and time are fundamental and constitute the arena in which processes are played out.

Aspects of human and animal behaviour that are truly automaton-like — the admittedly highly intricate but nonetheless unreflective responses to stimuli and to impulses arising from learned habits — can be accommodated within the mechanistic picture, in terms of brain mechanisms built up from the local interactions of neurons. If *all* our actions were of this kind, consciousness and subjective experience would be truly an unnecessary adjunct. Attempts to ‘explain’ consciousness would then amount to attempts to understand how neural mechanisms ‘produce’ it or ‘give rise’ to it. If, on the other hand, consciousness is an irreducible component of non-mechanistic aspects of reality then this approach to the problem of consciousness is doomed to failure. The problem then needs to be formulated rather differently, by asking a no less difficult question : how does the autonomous action of consciousness give rise to brain activity that transcends the mechanistic principles involved in the *purely local* action of neurons?

A mode of psychic activity that is somewhat analogous to mechanistic activity is the reasoning from premises to conclusions in terms of syllogisms — rigorously logical thinking. It is a very special kind of thinking, rarely found in its purest form. The nearest approach to it, perhaps, is to be found in the thought processes that follow the proof of a mathematical theorem, when conviction of the truth of the theorem is built up piecemeal from satisfaction of the correctness of each logical step. There is a fashion in scientific publishing whereby scientists, in reporting on their investigations and theories, strive to present things as if ‘scientific thinking’ consisted of this kind of reasoning. In fact, discovery in science is achieved by more flexible thought modes, involving imagination, speculation and intuition. Logical rigour is imposed after the event, when scientific ideas are *reported*. Reasoned argument is an artifact, an end-product distilled from more fluid, more holistic mental processes. The cognitive activity underlying it operates in terms of context and meaning. In cognitive activity, information is not merely ‘processed’, it is *understood*. Understanding arises from the organising of conscious subjective experience — a psychic activity that, I would suggest, transcends mechanistic, computational and algorithmic principles. I would suggest that the computational, algorithmic, information-processing activities of the brain do not ‘give rise’ to it, they are subservient to it, and that volition needs to be understood in these terms.

Psychic activity can be described in terms of a hierarchy of types of activity; the more precise, more focused mental activities such as logical reasoning have their genesis in deeper levels, where

processes are less focused but more holistic. There is a formative process giving rise to our conscious thoughts, that proceeds from the general to the particular. Exploratory, creative, intuitive psychic processes are the source of the surface levels of the 'rational' faculties. Still deeper levels of psychic activity lie below the threshold of ego-consciousness altogether. They are the so-called 'unconscious' archetypal levels that provide the psyche with its general patterns of organisation and function.

In chapter 5, I quoted Ted Hughes' description of the way a poem takes shape in the mind of the poet. It illustrates so well this picture of the emergence of a precise expression of thought from more generalised — in a sense 'vaguer' — mental activity, that it is worth repeating here:

The special kind of excitement, the slightly mesmerised and quite involuntary concentration with which you make out the stirrings of a new poem in your mind, then the outline, the mass and colour and clean final form of it, the unique living reality of it in the midst of the general lifelessness, all that is too familiar to mistake. That is hunting, and the poem is a new species of creature, a new specimen of the life outside your own.

— *Ted Hughes* ¹⁰

The rigorous, logical, reasoning faculties can be regarded as psychic analogues of the mechanistic processes that we see taking place in the physical world. I venture to suggest that the self-organising activities of the psyche, that are autonomous and in no way a product of the reasoning faculties, also have analogues in the physical world.

The non-local aspects of quantum physics modified the idea that the physical world is a 'mechanism', introducing a wider informational context underlying elementary events; but the new ingredient introduced only non-local correlations between essentially *random* aspects of elementary events. Thus, quantum theory does not provide any insight into the organisational activities that are evident in the origin and evolution of life, and particularly evident in brain activities associated with consciousness and volition. To account for these aspects of the world, we need to go beyond known physics; we need to conceive of the observable physical world as an epiphenomenon emerging from a deeper level of reality that is not organised according to 'local' principles, but where 'consciousness' operates in terms of context and meaning, where physical reality

resembles more closely psychic reality and, indeed, where the various dualistic dichotomies such as physical/mental, objective/subjective, cease to have any relevance.

The origin and evolution of life is a process of emergence of *purpose-oriented* form and behaviour. There are, as we have seen, many persuasive reasons for doubting the neo-Darwinist assertion that this intricate matter-organising process is driven only by 'mechanisms'. According to our hypothesis, it is brought into being by activity underlying physical reality as it is presently understood, that is in a sense 'cognisant' of holistic information that is neither local nor random, but involves context and meaning. The mutations that drive evolutionary processes would then not be random, but would be a response to meaning and context — a response imposed by the exploratory, creative, volitional action of 'consciousness'.

The intricate biochemical mechanisms underlying the phenomena of life are, of course, *necessary* for the organising activity to take place. The insights into the nature of these mechanisms, that molecular biology and cell biology have provided, have led to the 'rational' conviction that these mechanisms are *sufficient* to account for the phenomena. Driesch's entelechies have been relegated to the rubbish-heap of science. This may have been unwarranted. The 'rational' conviction may well be illusory. Organising principles could well be autonomous and irreducible.

We have now a metaphysical scheme that can be pictured in the following way: observable reality arises from underlying strata of reality, by formative processes that bring it into being from activities at deeper levels. Space and time, and the mechanistic and probabilistic laws of known physics, are features of the uppermost stratum. As we go deeper, these principles become less binding; the dynamical laws become less local in space and time, taking more account of patterns of organisation. Deeper still, time and space no longer exist — they are yet unformed. 'Dynamics' would cease, at these levels, to operate 'causally', because causality is a temporal concept. It would operate in terms of 'acausal connecting principles' acting 'synchronistically'. The deeper layers are embryonic forms of the patterns of events belonging to the topmost stratum. The upward movement, the morphogenesis of observed reality is, of course, not taking place in *time*, but in a dimension that can be thought of as 'timelike'. The evolution of life, a temporal development in the upper stratum, becomes more intelligible, and takes on something like a meaning and a purpose, when seen as the result of an upward striving of 'consciousness'. The use of words like 'meaning', 'purpose' and 'striving' might be regarded as objectionable;

they suggest an anthropomorphic view of natural processes. I claim that this is not undesirable, because I am postulating that the structure and function of the human psyche is a particular manifestation of activities that operate in the world at large — activities that are more closely related to psychic than to mechanical activity and that gave rise to the human psyche; I am advocating a return to the archaic view of human psyche as Microcosm. Evolution is a result of a creative, exploratory process whereby, in the course of time, the modes of operation characteristic of the deeper strata of reality, by organising matter, intrude more and more into the upper stratum. In living brains, this ‘consciousness’ acts in a highly focused way — as the *consciousness* that operates through the volitional actions of the organisms that ‘consciousness’ has evolved. *Volition* appears anomalous and incomprehensible in terms of the mechanistic laws of the uppermost stratum because it represents an *intrusion* of the laws of deeper levels.

‘Paranormal’ experiences begin to seem less incomprehensible when seen as intrusions, into the ‘ordinary’ reality of the upper stratum, of the non-local action of ‘consciousness’ characteristic of deeper-level processes.

Thus one begins to discern, in vague outline, a possibility of rendering intelligible some of the anomalies of the world as we experience it, that are incomprehensible, or even downright impossible, in terms of a narrow mechanistic model of reality.

Esoteric and Traditional World Views

Pre-scientific thinking tended to attribute to inanimate Nature qualities resembling attributes of the human psyche, and to produce ‘explanations’ that were, in fact, psychological projections. Physical processes were seen as expressions of a creative intellect, an *anima mundi*:

That *Anima* is nothing else, but that which doth animate and vivify a body or spirit: why then should not the catholick divine Spirit which filleth all, and operateth all, and in all, be termed the fountain of the world’s life; by which it liveth, moveth, and hath its being, and consequently, the essentiall life, and centroll or mental soul of the world, moving the created humid spirit thereof...

— Robert Fludd¹²

Rigorous scientific thinking developed at first side by side with the older animistic ways of thinking. It is well known that Newton devoted a great deal of his time to abstruse theological and alchemical studies, which he regarded as of equal importance with his scientific discoveries — discoveries that form the foundations of modern physics. Kepler, the discoverer of the mathematical laws of planetary motion, saw no contradiction in speaking of the motion of celestial bodies in the following terms:

...those motive powers of the stars share in some way in the capacity of thought so that as it were they understand, imagine, and aim at their path, not of course by ratiocination like us human beings but by an innate impulse implanted in them from the beginning of creation; just as do the animal faculties of natural things acquire, though without ratiocination, some knowledge of their goal to which they direct all their actions.

— *Johannes Kepler* ¹³

Eventually, scientific methods of investigation with their insistence on objectively verifiable statements, proved so powerful as a means of elucidating the mechanisms of physical processes, that these earlier animistic ways of thinking fell into disrepute — justifiably so in most cases; their ‘explanations’ were spurious and really explained nothing. The astonishing success of scientific investigation and the modes of explanation it provides has now given rise, in many quarters, to a growing conviction that these same explanatory modes will eventually produce a satisfactory understanding of ‘subjective’ aspects of reality, such as consciousness and volition.

Whereas pre-scientific thinking ‘explained’ objective facts in subjective terms, science now strives to explain subjective facts in objective terms.

Both these approaches are likely to be equally misguided. There is but one reality, which is neither ‘subjective’ nor ‘objective’, neither ‘mind’ nor ‘matter’. No unified understanding can come from ‘explaining’ one component of a dichotomy in terms of the other, if we are in fact dealing with two fundamentally irreducible facets of one reality that are *not* in the relationship of phenomenon and epiphenomenon.

...the idea of complementarity in modern physics has demonstrated to us, in a new kind of synthesis, that the

contradiction in the application of old contrasting conceptions (such as particle and wave) is only apparent; on the other hand, the employability of old alchemical ideas in the psychology of Jung points to a deeper unity of psychical and physical occurrences. To us, unlike Kepler and Fludd, the only acceptable point of view appears to be one that recognises *both* sides of reality — the quantitative and the qualitative, the physical and the psychical — as compatible with each other, and can embrace them both.

—Wolfgang Pauli ¹⁴

In tentatively suggesting a ‘psychophysical’ model of reality, in which a generalised ‘consciousness’ produces the observed world from an underlying reality, I am not advocating a return to obsolete ‘unscientific’ thinking, but searching for a more balanced view that acknowledges anomalous *facts* that the prevalent mechanistic philosophy cannot encompass, and either ignores or belittles. My speculations have arisen from a confrontation with these facts, and they will stand or fall according to the outcome of further investigation and elucidation of verifiable facts. In attempting to look behind the veil of observable reality, science is in a position similar to that of the psychologist attempting to deduce the nature of the hidden depths of the psyche from their effects in conscious subjective experience and behaviour. The existence and nature of deeper levels of reality beyond the observable world would, similarly, reveal themselves through their *effects* in the observable world. These effects show themselves in the non-mechanistic self-organising properties of living matter, in the existence of the subjective aspect of observable reality — in particular the existence of consciousness and volition — and in the anomalies of conscious subjective experience called ‘paranormal’ occurrences.

The speculative structure we have arrived at is curiously similar to various esoteric and traditional metaphysical systems. The idea of *strata* of reality, lying beyond the ordinary reality in which we live, is of course prominent in the rigmarole of theosophical and other ‘occult’ literature, where the strata are referred to as ‘astral planes’.

Kabbalah,¹⁵ the mystical tradition of Judaism, recognises four levels of reality: Aziluth (the world of Emanation), Beriah (the world of Creation), Yezirah (the world of Formation) and Assiyah (the world of Action). Assiyah is the world of ‘ordinary reality’, which comes into being through successive stages of unfolding from Aziluth. The successive stages have been compared to the stages involved in producing a house, from the initial conception of the idea of building

one, through the fluid stages of imagining the various possible forms it might take, then its detailed planning and design, and finally the actual building of it. These four stages are supposed to underlie all the phenomena of nature, in the outer (physical) world, and have their exact counterparts in the inner (psychic) world.

The concept of a hierarchy of realities, supporting and maintaining our 'ordinary' reality, is described by Govinda, in his exposition of Tibetan Buddhism, as follows:

Every Buddha is manifested in three planes of reality: the universal, the ideal, and the individual; and correspondingly, we distinguish three 'bodies' or principles in the form of the Buddha:

1. that in which the enlightened are equal, the experience of wholeness, of universality, the deepest impersonal reality of *Dharma*, the foundation of all laws and principles, from which all physical, moral, mental and metaphysical order flows: the *Dharma-kaya* (the 'universal body');
2. that which constitutes the mental or ideal constitution of a Buddha, the creative manifestation of that universal principle in the realm of ideal and inspirational reality: the *Sambhogakaya*, the 'body of spiritual ecstasy', out of which all deep inspiration is born;
3. that in which this inspiration transforms itself into visible appearance and becomes action: the *Nirmana-kaya*, the 'transformation body', the human embodiment or individuality of an enlightened one.

In *Dharma-kaya*, the universal principle of all consciousness, the totality of all being and becoming is contained — comparable with space, which enfolds all things and is the *conditio sine qua non* of all things, and of which we can say neither that it is identical with the things nor that it is distinguishable from them...

— *Lama Anagarika Govinda* ¹⁶

The conjectured formative agency that is responsible for the organisation of life and mind, that we have called 'consciousness', can be identified with the Buddhist concept of *trishna*, whose action brings the world into being:

Buddhist philosophy considers *trishna* or *tanha*, or 'thirst', the first principle of making things come into existence... It wills

to have form in order to express itself, which means to assert itself. As trisna is inexhaustible, the forms it take are infinitely varied. Trisna wants to see and we have eyes; it wants to hear and we have ears; it wants to jump and we have the deer, the rabbit and other animals of this order; it wants to fly and we have birds of all kinds; it wants to swim and we have fish wherever there are waters; it wants to bloom and we have flowers; it wants to shine and we have stars; ...trisna is the creator of the universe.

Being the creator, trisna is the principle of individuation. It creates a world of infinite diversities... When we really see into ourselves, trisna will bare itself before itself in us. As it is not an individualised object, self-inspection is the only way to approach it and make it reveal all its secrets...

Trisna lies in us not as one of the factors constituting our consciousness, but it is our being itself. It is I; it is you; it is the cat; it is the tree; it is the rock; it is the snow; it is the atom.

— *Daisetsu T. Suzuki*¹⁷

The Realisation of Possibilities

I have earlier introduced the Many Worlds interpretation of quantum physics, in which we have a superposition of all possible temporal developments, containing every possible sequence of events from the chaotic beginnings of the universe to its end. In this inconceivably intricate concept, alternative possible sequences of events are continually splitting off from each other, and the superposition contains them all.

We pictured the formative processes that bring this *actual* world into existence in terms of successive strata of formation. In this picture, the information content of the very deepest layer can be thought of as the total information content of the Many Worlds superposition, or something very similar. Let us borrow a word from Gnosticism, and call this substratum the ‘pleroma’. We can think of this particular world as emerging from the pleroma by a process of selection, proceeding from very broad and general selection of information to more specific selection; as we proceed upward through the strata, possibilities get progressively narrowed down. Things become more ‘real’. (This is not, of course, a temporal or ‘causal’ process. Space and time are artifacts of the process, belonging to the uppermost stratum — the *actual* world as it has developed up to the present moment).

The vague terms ‘reality’ and ‘existence’, in this scheme, are to be seen as referring to emergent properties. The pleroma ‘really exists’ only in the sense in which the concept of ‘all possible chess games’ exists. The activity of ‘consciousness’ in producing the actual world is ‘selection’ in the same way that we might speak of chess players selecting their strategies from the pleroma of ‘all possible chess games’.

Our hypothesis is that the selection is not entirely random and meaningless. If it were, life and mind would not have arisen. The selection is a process of organisation of information into complex patterns. This is the activity of ‘consciousness’. It is exploratory, creative, inventive. It has more in common with *psychic* activity than with what we know of physical activity. The mechanistic and probabilistic physics of inanimate, mindless ‘matter’, that we observe, can be thought of metaphorically as the result of the rigid ingrained habits and strictly logical ‘reasoning’ activities of ‘consciousness’.

Brain structure and function belong to the uppermost stratum. Underlying is the psychic reality of conscious subjective experience. The organising activities of the ‘unconscious’ mind lie at still deeper levels. Below that, psychic activity would become indistinguishable from the activity of ‘consciousness’, that has access to, and acts upon, information and knowledge that transcends the knowledge acquired by the individual psyche via sensory perception. At these levels, Jung’s ‘collective unconscious’ would not simply be a matter of common inheritance of psychic structure and function, belonging to each individual of our species, but would be truly *collective* in the sense of ‘shared by all’. In Jung’s later writings, there are many hints that he had arrived at this conclusion. At still deeper levels, the individual psyche merges with what, in archaic terminology, was called the ‘World Soul’ or ‘*Anima Mundi*’.

Once such a conclusion is accepted, many aspects of so-called paranormal experience appear much less bizarre and incomprehensible. Extra-sensory perception would be the result of impulses arising from levels deeper than the levels of the personal psyche of the individual, into the upper levels of conscious imagery. One might expect such impulses to be distorted, garbled or attenuated by the layers of the personal psyche they struggle up through — they would then emerge only as vague feelings and fleeting intuitions. This would account for the relative rarity and elusiveness of ESP phenomena. However, as the reports of spontaneous cases testify, they sometimes emerge with considerable vividness and clarity. There are, clearly, particular

psychological states conducive to this kind of receptivity, that occur more commonly in some individuals.

In telepathy, clairvoyance and precognition, the events perceived, and the imagery in the consciousness of the percipient, would correspond because they both arise from a common *source*. Telepathy would presumably arise from the level of the 'collective unconscious', clairvoyance and precognition from deeper levels of the *anima mundi*. Precognition need not necessarily be interpreted as a glimpse of an *inevitable* future occurrence, but rather, as a perception arising from levels where alternative future developments are being processed and assessed.

A glimpse of an alternative possibility, 'existing' at a level where alternatives are being assessed and processed, would appear to be what took place when Lieut. Larkin 'saw' his friend David McConnel, at about the time that David died in a plane crash sixty miles away. Lieut. Larkin perceived the alternative 'reality' in which the plane did *not* crash. The bifurcation of the sequence of events in this case is reminiscent of the one envisioned in Schrödinger's cat experiment. At some level below what 'actually' happened, there would be a superposition of states, corresponding to 'the plane crashed' and 'the plane did not crash'. The psychic disturbance associated with this bifurcation — either the trauma experienced by David as he was about to crash, or his actual death — would appear to have disrupted the 'normal' activity of 'consciousness' at the level of the bifurcation, giving rise to Larkin's anomalous perception of the 'alternate reality'. Whether some or all of these alternative worlds are as 'real' as this one, consciously experienced by their inhabitants, is perhaps an unanswerable question. After discussing the conventional Many Worlds view, Penrose remarked:

In particular, I do not see why a conscious being need be aware of only 'one' of the alternatives in linear superposition. What is it about consciousness that demands that one cannot be 'aware' of that tantalising linear combination of a dead cat and a live cat? It seems to me that a theory of consciousness would be needed before the many-worlds view can be squared with what one actually observes.¹⁸

In connection with the role of psychic trauma in many instances of paranormal perception, it is significant to note that precognitions are often, though not always, premonitions of disaster, and that apparitions are often, though not always, hallucinatory images

of individuals who have recently died. It would appear that drastic psychic disturbances in the upper strata can affect much deeper layers, and result in anomalous perceptual experience, and even anomalous physical manifestations.

In many instances of poltergeist activity, the repressed anxieties and frustrations of a child or adolescent create disturbances that reach the non-personal levels where the physical events of 'ordinary' reality are formulated. The rational activities of 'consciousness' that produce 'normal' happenings are disrupted — they are influenced by repressed impulses and give rise to occurrences in 'ordinary' reality characterised by childish perversity and mischievousness. Psychokinetic effects that disturb the 'normal' course of events less drastically would originate from shallower levels. Consequently, the psychic disturbances associated with them might be correspondingly milder: Helmut Schmidt's experiments seem to have shown that conscious psychic activity as undramatic as concentrating and attempting to 'will' something to happen can have a detectable effect on the statistical laws governing a sequence of elementary quantum events.

The literature of the paranormal indicates quite unequivocally that psychological states are an integral component of the processes that take place when paranormal events occur. For example, there is the relaxed, dreamy state associated with receptivity to clairvoyant perception, the sense of foreboding preceding premonitions of disaster, the tension and concentration of 'will power' that magicians claim to be the prerequisite for their alleged paranormal abilities, the 'Oz factor' or feeling of eeriness often reported in cases of UFO encounters, the emotional rapport between individuals that underlies instances of spontaneous telepathic communication, the religious fervour that generates 'miraculous' events, and so on. The events themselves and the *feelings* associated with them are inseparable. Parapsychologists have, I feel, paid too little attention to this aspect; the introduction of sensory deprivation as an experimental condition, in the 'ganzfeld' experiments, is a rare exception. Reliable ways of producing paranormal events artificially need to be developed in parallel with investigation of the role of psychological factors and mental states. What, for instance, is special about the personality characteristics — the psychic structure — of 'gifted psychics' that would account for their unusual receptivity to paranormal influences? Little is known.¹⁹ Unusual states of consciousness such as those produced by meditation, hypnosis, or drugs, and their effects on ESP have never been adequately explored. As a science, parapsychology is not even in its

infancy; it is still embryonic. But I can see no justification for calling it a 'pseudoscience'.

The individual conscious mind operates in terms of sensory perceptions, the imagery of sensory perceptions, and emotional states, so that all extra-sensory influences affecting it, whether arising from the 'personal unconscious' or from deeper strata, are necessarily apprehended by the conscious mind in these terms. In cases of telepathy, clairvoyance and precognition, the experience of the percipient can be unambiguously distinguished from 'normal' psychic experience — the workings of the personal psyche, such as imaginings, daydreams, hallucinations — only when veridical information is conveyed: when the experience corresponds in some respects with events in the 'actual' world, that can be corroborated. Even in such cases, a considerable contribution to the paranormal experience would be expected to derive from the imaginative faculties; such effects are present even in 'ordinary' perceptual experience, and especially so in their recall at a later time. The effects are unmistakable in religious visionary experience, where it is very obvious that the form of the vision is heavily influenced by the mythological preconceptions and expectations of the percipient. Since these experiences do not usually convey information about the 'actual' world that can be independently verified by checking facts, we can never with complete *certainty* interpret these events as paranormal if they are experienced by a single individual. However, in the many instances of shared visionary experience or 'collective hallucination' the situation is quite different — a paranormal interpretation is quite clearly called for. On the hypothesis of archetypal psychic levels *shared* by a group of individuals, these occurrences would originate from activity at these levels. But such an 'explanation' is of course, too vague and generalised to satisfy curiosity about these occurrences. Consider, for example, the classic case of the 'miracle of Fatima':

Several thousand people simultaneously experienced bizarre hallucinatory perceptions. Why did this happen? What kind of activity, in the deeper strata of reality, initiated it? Why, as in so many other instances of visionary experience, did many 'miraculous cures' subsequently take place in the same locality? It would seem as if the '*anima mundi*' is on these occasions attempting to communicate something to human minds. Why? Idries Shah, in his book on the Sufis, has emphasised that 'miraculous' events are to be understood, not by seeking their '*cause*', but by taking note of their effects on the human psyche, which reveal their *purpose*. The scientific method overemphasises causal explanations when attempting to answer

questions concerning *why* phenomena behave the way they do. The other kind of ‘Why?’ questions, that seek purposes, tend to be ignored, or simply dismissed as spurious. Idries Shah quotes the words of the Sufi master Bahaudin Naqshband:

Miracles have a function, and that function operates whether they are understood or not. They have a true [objective] function. Hence, miracles will in some people produce confusion, in others scepticism, in others fear, in others excitement, and so on. It is the function of the miracle to provoke reactions and supply nutriment; nutriment in this case which varies with the personality acted upon. In all cases the miracle is an instrument of both influence and assessment of the people acted upon.

—*Naqshband*²⁰

Could it not be that ‘miraculous’ events — paranormal experiences — are the sporadic manifestations of a tentative, exploratory process of *psychic* evolution, acting in parallel with and complementing the *physical* process of evolution *which are themselves no less ‘miraculous’?*

In attempting to construct a conceptual framework that might render paranormal processes more intelligible, I have appealed to a Many Worlds picture, in which ‘consciousness’ acts selectively, extracting possibilities from a plethora of self-consistent alternatives, giving rise to the ‘actual’ world of observable events. I have conceived of this activity as analogous to psychic activity — the activity of the human psyche being a component of it. What we call the ‘actual’ world or the ‘real’ world is an *experienced* world as much as it is an ‘objective’ world. That is to say, the world that can be known by us consists of psychic events — subjective experiences. Subjective experiences include fantasies, imaginings and dreams. Might not these aspects of psychic activity have their counterparts in the activity that gives rise to the world? Some of the stranger aspects of paranormal experience lend some support to this wildly fanciful notion. For example:

The phenomenon of alien encounters and ‘alien abductions’, that has surfaced over the last few decades, produces human experiences that are too numerous, too weird, and too similar to each other, for the supposition that they are simply arising from the *personal* psyches of the individuals who have undergone this kind of frightening experience. Those readers who doubt it are advised to study the

literature on this topic. The specific peculiarities of this phenomenon, its apparent lack of either cause or purpose, its apparent 'senselessness', set it apart from more 'normal' instances of paranormal experience. The 'entities' that seem to be interacting with human beings through this phenomenon often appear to be as puzzled by our reality, as we are by theirs. Their apparent curiosity about our world is a naive kind of curiosity — they seem more like the fragmentary personalities of a dissociated psyche than like fully-formed intelligences. In this respect, they have much in common with the apparitions that present themselves in religious visions. When they communicate, their 'messages' are often simplistic and childish. How much 'awareness' do they have? Perhaps the worlds they inhabit are the dream-worlds of the 'collective unconscious' — the fragmentary eddies and backwaters of the activity that creates the 'real world'.

But here, attempts to rationalise reach their limits. I have no wish to pile speculation on speculation in a vain attempt to comprehend the incomprehensible. All I have tried to do, throughout this book, is to demonstrate that there is no basis for the widespread belief that paranormal events are impossible, that the evidence that they do in fact occur is by no means inconsiderable, and that a rational understanding of them may not be unattainable.

Notes and References

1. Bohm 1981.
2. Pickover, C.A., *Computers, Pattern, Chaos and Beauty*, St. Martins, New York 1991, chapter 16, and references cited therein; Burk, A.W. (ed.), *Essays on Cellular Automata*, Univ. of Illinois 1970.
3. Schrandt, R.G. & Ulam, S., in Burk (ed.), ref. 2.
4. Hofstadter & Dennett 1981, p.319.
5. Penrose 1990, p. 565.
6. Dawkins 1986.
7. Born, M., *Atomic Physics*, Blackie, London 1935; 6th edn. 1957, p. 311.
8. Bohm, 1981.
9. Horgan, J., Can science explain consciousness? *Scientific American*, Jul 1994, 72; Voss, D., Soul Searching with Francis Crick, *Omni*, Feb. 94, p.46; Crick, 1994.
10. Ted Hughes, *Poetry in the Making*, Faber, London 1967, p. 17.
11. The inappropriateness of this term becomes starkly apparent in this context!
12. Quoted by Jocelyn Godwin, in *Robert Fludd: Hermetic Philosopher and Surveyor of Two Worlds*, Thames & Hudson, London 1979, p. 16.
13. Quoted from Kepler's *De Stella Nova* by Pauli, in Jung & Pauli 1955, p. 173.
14. *ibid.*, p. 208.

15. Scholem 1969; Halevi 1979.
16. Govinda 1975, p. 253.
17. Suzuki 1957, p. 89.
18. Penrose 1990, p. 382.
19. See Thalbourne, M.A., An attempt to predict precognitive scores using
transliminality-relevant variables, *J. Soc. Psychical Res.* 61 (1996) 129, and
the cited references.
20. Idries Shah 1964, p. 368.

BIBLIOGRAPHY

- Abell, G.O. & Singer, B. (eds), *Science and the Paranormal: Probing the Existence of the Supernatural*, Scribners, New York 1981.
- Allen, Warner, *The Timeless Moment*, Faber & Faber, London 1946.
- Andresen, J. & Forman, R.K.C. (eds), *Cognitive Models and Spiritual Maps: Interdisciplinary Explorations of religious Experience*, Imprint Academic, Thorverton, 2000.
- Aram, K., *Magie und Mystik in Vergangenheit und Gegenwart*, Albertus, Berlin 1929.
- Ashby, R.H., *The Guidebook for the Study of Psychical Research*, Rider, London 1972.
- Attenborough, David, *Life on Earth*, Collins, London 1979.
- Aurobindo, Sri, *The Life Divine*, 1914-1919, Sri Aurobindo Library, New York 1949; 5th edn. Sri Aurobindo Ashram, Pondicherry 1970.
- Badcock, C., *PsychoDarwinism*, HarperCollins, London 1994.
- Baker, R.A. & Nickel, J., *Missing Pieces: How to Investigate Ghosts, UFOs, Psychics and Other Mysteries*, Prometheus, New York 1993.
- Bancroft, Anne, *The Luminous Vision*, Allen & Unwin, London 1982.
- Bannerjee, H.N., *Americans who have been Reincarnated*, Macmillan, New York 1980.
- Barclay, D., *Aliens: The Final Answer*, Cassell, London 1995.
- Bard, Jonathan, *Morphogenesis: The Cellular and Molecular Processes of Developmental Anatomy*, Cambridge Univ. Press 1990.
- Barrett, Sir William, *On the Threshold of the Unseen*, Kegan Paul, Trench & Trübner, London 1920; Dutton, New York 1920.
- *Death Bed Visions*, Methuen, London 1926; Aquarian, Wellingborough 1986.
- & Besterman, Theodore, *The Divining Rod*, University Books, New York 1968.
- Baudelaire, C., *Les Paradis Artificiels*, 1860; Gallimard, Paris 1961.
- Beloff, J., *New Directions in Parapsychology*, Paul Elek, London 1974.
- Bennett, Sir Ernest, *Apparitions and Haunted Houses*, Faber & Faber, London 1939.
- Bentine, Michael, *The Doors of the Mind*, Granada, London 1989.
- Berlitz, Charles, *Charles Berlitz's World of Strange Phenomena*, Sphere, London 1989.
- *Charles Berlitz's World of the Odd and the Awesome*, Ballantine, New York 1991.
- Beverage, W.I.B., *The Art of Scientific Investigation*, Heinemann, London 1950.
- Bird, C., *The Divining Hand*, Dutton, New York 1979.
- *Divining*, McDonald James, London 1979.
- Blakemore, C.B., *Mechanics of the Mind* (BBC Reith Lectures 1976), Cambridge Univ. Press 1977.
- Blackmore, Susan J., *Beyond the Body*, Granada, London 1983.
- *Dying to Live*, Grafton, London 1993.
- Block, N., Flanagan, O. & Güzeldere, G. (eds), *The Nature of Consciousness: Philosophical Debates*, MIT Press, Cambridge MA 1996.

- Boar, R. & Blundell, N., *The World's Greatest UFO Mysteries*, Octopus, London 1983; Hamlyn, London 1991.
- Boden, M.A., *The Creative Mind: Myths and Mechanisms*, Weidenfeld & Nicholson, London 1990.
- Bohm, David, *Wholeness and the Implicate Order*, Routledge & Kegan Paul, London 1981.
- Bonner, J.T., *Cells and Societies*, Princeton Univ. Press 1965.
- *The Cellular Slime Moulds*, Princeton Univ. Press 1967.
- Bord, Janet & Colin, *Alien Animals*, Granada, London 1980.
- *Modern Mysteries of Britain: 100 Years of Strange Events*, Grafton, London 1987.
- *Modern Mysteries of the World: Strange Events of the 20th Century*, Grafton, London 1989.
- Borst, C.V. (ed.), *The Mind / Brain Identity Theory*, London 1929.
- Bowen, Charles (ed.), *The Humanoids: A Survey of World-Wide Reports of Landings of Unconventional Objects and their Alleged Occupants*, Spearman, London, & Regnery, Chicago 1969.
- Broad, C.D., *Mind and Its Place in Nature*, Routledge & Kegan Paul, London 1929.
- *Lectures on Psychical Research*, Routledge & Kegan Paul, London 1962.
- Broad, W. & Wade, N., *Betrayers of the Truth: Fraud and Deceit in the Halls of Science*, Simon & Schuster, New York 1982.
- Bronowski, J., *The Ascent of Man*, BBC, London 1973.
- Brookesmith, P. (ed.), *The Alien World : Major UFO Cases Examined and Reassessed*, Orbis, London 1984a.
- *The UFO Casebook*, Orbis, London 1984b.
- *UFOs: Where do They Come From?* Orbis 1984c.
- *Thinking the Unthinkable: Ideas that Overturn Conventional Thought*, Orbis 1984d.
- *Against all Reason: The Paranormal on Test*, Orbis 1984e.
- *The Enigma of Time: The Last Mystery of the Universe*, Orbis 1984f.
- Brunton, Paul, *A Search in Secret India*, Rider, London 1934.
- *A Search in Secret Egypt*, Rider, London 1935.
- Burnham, Sophie, *A Book of Angels: Reflections on Angels Past and Present and True Stories of How They Touch Our Lives*, Dell, New York 1994.
- Bryan, C.D.B., *Close Encounters of the Fourth Kind: A Reporter's Notebook on Alien Abduction, and the Conference at M.I.T.*, Knopf, New York 1995; Penguin 1996.
- Cairns-Smith, A.G., *Evolving the Mind: On the Nature of Matter and the Origin of Consciousness*, Cambridge Univ. Press 1996.
- Carrington, H., *Eusapia Palladino and her Phenomena*, Dodge & Co., New York 1909.
- *Personal Experiences in Spiritualism*, Werner Laurie, London 1910.
- *The American Seances with Eusapia Palladino*, Garrett, New York 1954.
- Cassirer, M., *Dimensions of Enchantment*, Breese, London 1994.

Bibliography

- Cavendish, R. (ed.), *Encyclopedia of the Unexplained*, Routledge, London, & McGraw Hill, New York 1974.
- Christie-Murray, D., *Reincarnation: Ancient Beliefs and Modern Evidence*, Prism, London 1991.
- Clark, Jerome, *UFO Encounters and Beyond*, Signet, New York 1993.
- *The UFO Encyclopedia* (3 vols), Omnigraphia, New York 1990, 1992, 1995.
- Clark, John H., *A Map of Mental States*, Routledge & Kegan Paul, London 1983.
- Claxton, Guy, *Noises from the Darkroom: The Science and Mystery of the Mind*, Harper Collins, London 1994.
- Clowes, Royston, *The Structure of Life*, Penguin 1967.
- Cohen, D., *J.B. Watson: the Founder of Behaviourism*, London 1979.
- Coleman, Loren, *Curious Encounters: Phantom Trains, Spooky Spots and Other Mysterious Phenomena*, Faber & Faber, Boston 1994.
- Combs, A. & Holland, M., *Synchronicity: Science, Myth and the Trickster*, Floris, London 1994.
- Conroy, Ed, *Report on Communion: The Facts Behind the Most Controversial Story of Our Time*, Avon, New York 1989.
- Corliss, W.K., *The Unexplained: A Sourcebook of Strange Phenomena*, Bantam, New York 1976.
- *Handbook of Unusual Natural Phenomena: Eyewitness Accounts of Nature's Greatest Mysteries*, 1997, Gramercy, New York 1983, 1995.
- Coxhead, D. & Hiller, Susan, *Dreams: Visions of the Night*, Thames & Hudson, London 1976.
- Crabtree, R., *Multiple Man: Explorations in Possession and Multiple Personality*, Collins, Canada 1985.
- Cracknell, R., *Clues to the Unknown*, Hamlyn, London 1981.
- Crick, Sir Francis, *The Astonishing Hypothesis: The Scientific Search for the Soul*, Simon & Schuster, New York 1994.
- Cromer, A., *Uncommon Sense: The Heretical Nature of Science*, Oxford Univ. Press, New York 1993.
- Crookall, R., *Out of the Body Experiences*, University Books, New York 1970.
- *The Jung-Jaffé View of Out-of-the-Body Experiences*, World Fellowship Press, 1970.
- *Casebook of Astral Projection*, University Books, New York 1972.
- *The Supreme Adventure*, James Clarke, London 1961.
- Crookes, William, *Researches in the Phenomenon of Spiritualism*, London 1874.
- Crowe, Catherine, *The Night Side of Nature*, Routledge, London 1845; Aquarian Press, Wellesborough 1988.
- Cummins, G. & Toksvig, S., *Swan on a Black Sea*, Routledge & Kegan Paul, London 1965.
- Curran, Douglas, *In Advance of the Landing: Folk Concepts of Outer Space*, Abbeville, New York 1985.

- Cytowic, R.E., *The Man Who Tasted Shapes*, Abacus, London 1992.
- Damasio, A.R., *Descartes' Error: Emotion, Reason and the Human Brain*, Putnam, New York 1994; Picador, London 1995.
- Däniken, Erich von, *Miracles of the Gods*, Corgi, London 1977a (first publ. *Erscheinungen: Phenomene die die Welt Erregen*, Econ Verlag, Düsseldorf 1974).
- *According to the Evidence*, Souvenir, London 1977b (first publ. *Beweise*, Econ, Dusseldorf 1977).
- Darling, David, *Soul Search*, Villard, New York 1995.
- Darwin, Charles, *On the Origin of Species by Means of Natural Selection or the Preservation of Favoured Races in the Struggle for Survival*, John Murray, London 1859.
- David-Neel, Alexandra, *Magic and Mystery in Tibet*, Souvenir Press, London 1967; Unwin, London 1984.
- Davis, Paul, *The Mind of God: Science and the Search for Ultimate Meaning*, Simon & Schuster, London 1992.
- Davis, P.C.W. & Brown, J.R. (eds), *The Ghost in the Atom: A Discussion of the Mysteries of Quantum Physics*, Cambridge Univ. Press 1994.
- Dawkins, Richard, *The Selfish Gene*, Oxford Univ. Press 1976.
- *The Blind Watchmaker*, Longman, London 1986.
- *The Extended Phenotype: The Gene as the Unit of Selection*, Oxford Univ. Press 1982; 1994.
- Deikman, A., *The Observing Self: Mysticism and Psychotherapy*, Beacon, Boston MA 1982.
- de la Mettrie, J. O., *L'Homme Machine*, 1784 (transl. Illinois 1912).
- Dennett, Daniel C., *Consciousness Explained*, Little, Brown & Co., New York 1992.
- Denton, D., *The Pinnacle of Life: Consciousness and Self-Awareness in Humans and Animals*, HarperCollins, London 1995.
- de Quincey, Thomas, *Confessions of an English Opium Eater*, 1821; Oxford Univ. Press 1985.
- Descartes, R., *Discours de la Methode*, Paris 1637 (transl. Haldane, E.S. & Ross, G.R.T., Cambridge Univ. Press 1967).
- Dingwall, E.J., *Abnormal Hypnotic Phenomena* (4 vols.), J. & A. Churchill, London 1968.
- & Hall, T.H., *Four Modern Ghosts*, Duckworth, London 1958.
- Douglas, Alfred, *Extra-Sensory Powers*, Victor Gollancz, London 1976.
- Doyle, Sir Arthur Conan, *The Wanderings of a Spiritualist*, Hodder & Stoughton, London 1921.
- Driesch, H., *The Science and Philosophy of the Organism: Gifford Lectures*, 1908; Black, London 1929.
- *Psychical Research*, London 1933.

Bibliography

- Ducasse, C.J., *The Belief in Life After Death*, Charles Thomas, Springfield Illinois 1961.
- Duncan, R. & Weston-Smith, M. (eds), *Encyclopaedia of Ignorance*, London 1972.
- Dunne, J.W., *An Experiment with Time*, Faber & Faber 1927.
- Eccles, SirJohn C., *The Neurological Basis of Mind*, Oxford Univ. Press 1953.
- (ed.), *Brain and Conscious Experience*, Springer, New York 1966.
- *The Understanding of the Brain*, McGraw Hill, New York 1977.
- *How the Self Controls Its Brain*, Springer, New York 1995.
- & Robinson, D.N., *The Wonder of Being Human*, Macmillan, New York 1984.
- Eddington, A.S., *New Pathways in Science*, Cambridge Univ. Press 1936.
- *The Philosophy of Physical Science*, Cambridge Univ. Press 1939.
- Edelman, G.M., *Neural Darwinism: The Theory of Neuronal Group Selection*, Basic Books, New York 1987.
- *The Remembered Present: A Biological Theory of Consciousness*, Basic Books, New York 1989.
- *Bright Air, Brilliant Fire*, Penguin 1992.
- Ebon, M., *True Experiences with Ghosts*, Garrett, New York 1956; New American Library, New York 1968.
- *They Knew the Unknown*, World Publishing Co., New York 1971.
- *Exorcism: Fact not Fiction*, New American Library, New York 1974.
- *The Evidence for Life After Death*, New American Library, New York 1977.
- *Psychic Warfare*, St. Martins Press, New York 1984.
- Eliade, Mircea, *Myths, Dreams and Mysteries*, Harvill, London 1960.
- *Shamanism: Archaic Techniques of Ecstasy*, Pantheon, London 1964.
- Elliot, J.S., *Dowsing: One Man's Way*, Neville Spearman, London 1977.
- Enright, J.D., *The Oxford Book of the Supernatural*, Oxford Univ. Press 1994.
- Evans, C. & Evans, P., *Landscapes of The Night: How and Why We Dream*, Victor Gollancz, London 1983.
- Evans, C.R. & Mulholland, T.B. (eds), *Attention in Neurophysiology*, Butterworth, London 1969.
- Evans, Hilary, *Gods, Spirits, Cosmic Guardians*, Aquarian, Wellingborough 1967.
- Evans-Wentz, W.Y., *The Fairy Faith in Celtic Countries*, Oxford Univ. Press 1911; Citadel, New York 1994.
- Eysenck, H.J., *Sense and Nonsense in Psychology*, Penguin 1957.
- & Nias, D.K.B., *Astrology: Science or Superstition?* St. Martins, London 1982.
- & Sargent, C., *Explaining the Unexplained: Mysteries of the Paranormal*, Prion Books, London 1992.
- Farber, S.L., *Identical Twins Reared Apart*, Basic Books, New York 1980.
- Ferguson, Kitty, *The Fire in the Equations: Science, Religion and the Search for God*, Bantam, London 1994.
- Fisher, J., *The Case for Reincarnation*, Collins, London 1984; Bantam, New York 1985.

- Flammarion, Camille, *The Unknown*, Harper, London 1900 (original French: *L'inconnu et les problèmes psychique*).
- *Death and Its Mysteries* (3 vols), T.Fischer-Unwin, London 1921-23.
- *Haunted Houses*, T. Fischer-Unwin, London 1924.
- Fodor, Nandor, *Encyclopaedia of Psychic Science*, Arthurs Press, London 1934; University Books, New York 1966.
- *The Haunted Mind*, Garrett, New York 1959.
- Forman, R.K.C. (ed.), *The Problem of Pure Consciousness: Mysticism and Philosophy*, Oxford Univ. Press 1990.
- Fort, Charles, *The Books of Charles Fort*, Henry Holt, New York 1941.
- *The Book of the Damned*, 1919; Abacus 1974; Sphere, London 1979.
- *New Lands*, 1923; Sphere, London 1974.
- Fowler, R.E., *The Andreasson Affair*, Prentice-Hall, Eaglewood Cliffs, NJ 1979; Bantam, New York 1980.
- Fox, Oliver, *Astral Projection*, University Books, New York 1962.
- Frazier, K. (ed.), *Paranormal Borderlands of Science*, Prometheus, Buffalo NY 1981.
- Fuchs, Ernst, *Architectura Caelestis*, Dtv, Munich 1973.
- *Bilder und Zeichnungen, 1945-1976*, Piper, Munich 1977.
- Fuller, J.G., *The Interrupted Journey*, Dell, New York 1987.
- Gardner, Martin, *Fads and Fallacies in the Name of Science*, Dover, New York 1957; revised and expanded from *In the Name of Science*, Putnam, New York 1952.
- *Science: Good, Bad and Bogus*, Prometheus, New York 1981; Oxford Univ. Press 1983a.
- *Order and Surprise*, Prometheus, New York 1981; Oxford Univ. Press 1983b.
- Garrett, Eileen J., *Telepathy*, Creative Age, New York 1941.
- *Adventures in the Supernatural: A Personal Memoir*, Creative Age, New York 1949.
- Gauld, A. & Cornell, A.D., *Poltergeists*, Routledge & Kegan Paul, London 1979.
- Gauquelin, M., *The Cosmic Clocks*, Regnery, New York 1967.
- *The Scientific Basis of Astrology: Myth or Reality?* Stein and Day, New York 1969.
- *Birth-Times*, Hill & Wang, New York 1983.
- Gazzaniga, M.S., *The Bisected Brain*, Appleton-Century-Crofts, New York 1970.
- George, F., *Man the Machine*, Paladin, London 1979.
- Globus, G.G., Maxwell, G. & Savodnic, I., *Consciousness and the Brain: A Scientific and Philosophical Enquiry*, Plenum, New York 1976.
- Goldschmidt, R., *The Material Basis of Evolution*, Yale Univ. Press 1940.
- Goleman, D., *The Varieties of Meditative Experience*, Wiley, New York 1977.
- Gooch, Stan, *Creatures from Inner Space*, Rider, London 1984.
- Good, I.J. (ed.), *The Scientist Speculates*, Heinemann, London 1961.
- Goodman, B., Sibatani, A. & Webster, G. (eds), *Dynamic Structure in Biology*, Edinburgh Univ. Press 1989.

Bibliography

- Goodman, J., *Psychic Archaeology*, Putnam, New York 1977.
- Gordon, Stuart, *The Paranormal: An Illustrated Encyclopedia*, Headline, London 1992.
- *The Book of Miracles: From Lazarus to Lourdes*, Headline, London 1996.
- Goss, Michael, *Poltergeists: An Annotated Bibliography of Works in English, circa 1880-1975*, Scarecrow, Metuchen NJ 1979.
- Goswami, A., *The Self-Aware Universe: How Consciousness Creates the Material World*, Tarcher, New York; Putnam, London 1993.
- Govinda, Lama Anagarika, *The Way of the White Clouds: A Buddhist in Tibet*, Rider, London 1966.
- *Grundlagen tibetische Mystic*, Fischer, Frankfurt 1975.
- Gratten-Guinness, I. (ed.), *Psychical Research: A Guide to its History, Principles and Practices*, Aquarian, Wellingborough 1982.
- Graves, T., *Dowsing*, Turnstone Press, London 1976.
- Green, A., *The Evidence for Ghosts*, Aquarian, Wellingborough 1985.
- Green, Celia, *The Human Evasion*, Institute of Parapsychological Research, Oxford 1968a.
- *Lucid Dreams*, Hamish Hamilton, London 1968b.
- *Out of the Body Experiences*, Hamish Hamilton, London 1968c.
- *The Decline and Fall of Science*, Hamish Hamilton, London 1976.
- & McCreery, Charles, *Apparitions*, Hamish Hamilton, London 1975.
- Greenhouse, H.B., *The Astral Journey*, Institute of Parapsychological Research, Oxford 1968.
- *Premonitions: A Leap into the Future*, Turnstone, London 1972.
- Gregory, Richard L., *Concepts and Mechanisms of Perception*, London 1974.
- *Mind in Science*, Weidenfeld & Nicholson, London 1981; Penguin 1984.
- (ed.), *The Oxford Companion to the Mind*, Oxford Univ. Press 1989.
- Gribbin, John, *In Search of Schrödinger's Cat: Quantum Physics and Reality*, Wildwood House, London 1984; Black Swan, London 1991.
- Guiley, Rosemary E., *Harper's Encyclopedia of Mystical and Paranormal Experience*, Harper, San Francisco 1991.
- Gurney, E., Myers, F.W.H. & Podmore, F., *Phantasms of the Living*, Trübner, London 1886.
- Hadamard, J., *The Psychology of Invention in the Mathematical Field*, Princeton Univ. Press 1945.
- Haldane, J.B.S., *Possible Worlds*, Chatto & Windus 1927.
- Halevi, Z. ben Shimon, *Kabbalah: Tradition of Hidden Knowledge*, Thames & Hudson, London 1979.
- Halifax, Joan, *Shamanic Voices: A Survey of Visionary Narratives*, Dutton, London 1979.
- *Shaman: The Wounded Healer*, Thames & Hudson, London 1982.

- Hameroff, S.R., Kaszniak, A.W. & Scott, A.C., *Towards a Science of Consciousness: Philosophical Debates*, MIT Press, Cambridge MA 1996.
- Hanson, R.W. (ed.), *Science and Creation: Geological, Theological and Educational Perspectives*, Macmillan, New York 1986.
- Happold, F.C., *Mysticism: A Study and an Anthology*, Penguin 1963.
- Hardy, Sir Alister, *The Living Stream*, Collins, London 1965.
- *The Spiritual Nature of Man: A Study of Contemporary Religious Experience*, Oxford Univ. Press 1979.
- , Harvey, R. & Koestler, A., *The Challenge of Chance*, Hutchinson, London 1973.
- Harpur, P., *Daimonic Reality: A Fieldguide to the Other World*, Penguin 1994.
- Herbert, Nick, *Elemental Mind: Human Consciousness and the New Physics*, Plume Penguin, New York 1994.
- Heywood, Rosalind, *The Sixth Sense*, Pan, London 1966.
- *The Infinite Hive*, Pan, London 1964.
- Hilgard, E.R., *Divided Consciousness: Multiple Controls in Human Thought and Action*, Wiley, New York 1977.
- Hill, D. & Williams, P., *The Supernatural*, Aldus, New York 1965.
- Hitching, F., *Earth Magic*, Cassell, London 1966.
- *Pendulum: the Psi Connection*, Esoteric Publications, Arizona 1976; Fontana, London 1977.
- Ho, M.-W. & Saunders, P.T. (eds), *Beyond Neo-Darwinism: Introduction to the New Evolutionary Paradigm*, Academic Press, London 1987.
- Hofstadter, Douglas R., *Gödel, Escher, Bach: An Eternal Golden Braid*, Basic Books, New York 1979; Penguin 1980.
- *Metamagical Themas*, Basic Books, New York 1985; Bantam, London 1986.
- & Dennett, D.C. (eds), *The Mind's I*, Penguin 1982.
- Holroyd, S., *Psi and the Consciousness Explosion*, The Bodley Head, London 1977.
- Holzer, Hans, *ESP and You*, Leslie Frewin, London 1969, 1983.
- Home, Daniel Dunglass, *Incidents in My Life*, Tinsley Bros., London 1872.
- Honderich, T. (ed.), *Essays on Freedom of Action*, Routledge & Kegan Paul, London 1973.
- Honorton, C. & Rogo, D. Scott, *Psychic Breakthroughs Today*, Aquarian, Wellingborough 1987.
- Hopkins, Budd, *Missing Time*, Richard Marek, New York 1981; Random House, New York 1988.
- *Intruders*, Random House, New York 1987.
- Hoyle, F. & Wickramasinghe, C., *Evolution from Space*, Dent, London 1981.
- *Cosmic Life Force*, Dent, London 1988.
- Hudson, T.J., *The Law of Psychic Phenomena*, Putnam, London 1982.
- Hurkos, Peter, *Psychic: The Story of Peter Hurkos*, Arthur Barker, London 1962.
- Huxley, Aldous, *The Devils of Loudun*, Chatto & Windus, London 1952; Collins, London 1977.

Bibliography

- *The Doors of Perception*, Chatto & Windus, London 1954.
- *The Doors of Perception & Heaven and Hell*, Chatto & Windus, London 1971.
- *Moksha: Writings on Psychedelics and the Visionary Experience 1931-63*, (H. Horowitz & C. Palmer, eds), Penguin 1983; HarperCollins, London 1994.
- Huxley, Julian S., *Evolution: The Modern Synthesis*, Allen & Unwin 1942.
- , Hardy, A.C. & Ford, E.B. (eds), *Evolution as a Process*, Allen & Unwin, London 1954.
- Hynek, J. Allen, *The Hynek UFO Report*, Dell, New York; Sphere, London 1978.
- & Vallée, Jaques, *The Edge of Reality*, Henry Regnery, Chicago 1975.
- , Imbrogno, P.J. & Pratt, B., *Night Siege: The Hudson Valley UFO Sightings*, Ballantine, New York 1987.

- Ingalese, R., *The History and Power of the Mind*, Occult Books Concern, New York 1905.
- Inglis, Brian, *Science and Parascience*, Hodder & Stoughton, London 1984.
- *Natural and Supernatural*, Hodder & Stoughton, London 1985a.
- *Dictionary of the Paranormal*, Granada, London 1985b
- *The Power of Dreams*, Paladin, London 1988.

- Jacobs, David M., *Secret Life: First Hand Accounts of UFO Abductions*, Simon & Schuster, New York 1992.
- Jaccoliot, Louis, *Occult Science in India and Among the Ancients*, Madras 1911; University Books, New York 1971.
- Jaffé, Aniela, *Apparitions and Precognition*, University Books, New York 1976 (transl. from *Geistererscheinungen und Vorzeichen*, Zurich 1958).
- James, William, *Principles of Psychology*, New York 1890.
- *The Varieties of Religious Experience*, New York 1902; Fontana, London 1960; Macmillan, New York 1961.
- Jantsch, E., *The Self-Organizing Universe*, Pergamon, New York 1980.
- Jaynes, J., *The Origin of Consciousness in the Breakdown of the Bicameral Mind*, Houghton-Mifflin, Boston MA 1976.
- Jeans, Sir James, *The Mysterious Universe*, Cambridge Univ. Press 1937.
- Johnson, George, *Machinery of the Mind: Inside the New Science of Artificial Intelligence*, Random House, New York 1986.
- Josephson, B.D. & Ramachandran, V.S. (eds), *Consciousness and the Physical World*, Oxford Univ. Press 1980.
- Jung, Carl Gustav, *The Collected Works* (18 vols. transl. from German by R.F.C. Hull), Routledge & Kegan Paul, London 1968.
- *Psychological Reflections* (Jacobi, Jolande, ed.), Routledge & Kegan Paul, London 1945 (originally: *Psychologische Betrachtungen*, Raschner, Zurich 1945).
- *Flying Saucers: A Modern Myth of Things Seen in the Sky*, Routledge & Kegan Paul, London 1959; 1977.

- *Memories, Dreams and Reflections*, Routledge & Kegan Paul, London 1963; 1983 (originally: *Erinnerungen, Träume, Gedanken*, 1961).
- *Psychology and the Occult*, Routledge & Kegan Paul, London 1982a.
- *On the Nature of the Psyche*, Routledge & Kegan Paul, London 1982b.
- *Dreams*, Routledge & Kegan Paul, London 1984.
- *Synchronicity: An Acausal Connecting Principle*, 1955; Routledge & Kegan Paul, London 1985.
- *Four Archetypes*, Routledge & Kegan Paul, London 1986.
- *C.G.Jung Speaking: Interviews and Encounters* (McGuire, W. & Hull, R.F.C., eds), Picador, London 1980.
- & Pauli, W., *Naturerklärung und Psyche*, Raschner, Zurich 1952 (English transl. *The Interpretation of Nature and the Psyche*, Routledge & Kegan Paul, London 1955).
- & von Franz, M.-L. (eds), *Man and his Symbols*, Aldus Books, London 1964; Picador, London 1978.

- Kammerer, P., *Das Gesetz der Serie*, DVA, Stuttgart 1919.
- *The Inheritance of Acquired Characteristics*, New York 1924.
- Keel, J.A., *Our Haunted Planet*, Spearman, London 1971.
- *Strange Creatures from Time and Space*, Spearman 1975; Sphere, London 1976.
- Keeton, W., *Biological Science*, Norton, New York 1976; 3rd edn. 1980.
- Kenny, A.J.P. (ed.), *Rationalism, Empiricism and Realism*, Oxford Univ. Press 1989.
- King, C.D., *The States of Human Consciousness*, University Books, New York 1963.
- Kirk, Rev. Robert, *The Secret Commonwealth of Elves, Fauns and Fairies*, 1691; edited with commentary by Stewart Sanderson, Brewer, Suffolk 1976.
- Klass, P.J., *UFOs Explained*, Vintage, New York 1974.
- *UFOs: The Public Deceived*, Prometheus, Buffalo NY 1983.
- Klüver, H., *Mescal: The Divine Plant and Its Psychological Effects*, Kegan Paul, Trench & Trübner, London 1928.
- *Mescal and Mechanisms of Hallucinations*, Chicago Univ. Press 1966.
- Knight, Damon, *Charles Fort: Prophet of the Unexplained*, Victor Gollancz, London 1971.
- Knight, D.C., *The ESP Reader*, Castle Books 1969.
- Koestler, A., *The Sleepwalkers*, Hutchinson, London 1969.
- *The Ghost in the Machine*, Hutchinson, London 1967.
- *The Act of Creation*, Hutchinson, London 1969.
- *The Case of the Midwife Toad*, Hutchinson, London 1971.
- *The Roots of Coincidence*, Hutchinson, London 1972.
- *Janus: A Summing Up*, Hutchinson, London 1978; Pan, London 1979.
- & Smythies, J.R. (eds), *Beyond Reductionism*, Beacon, Boston MA 1969.
- Kuhn, Thomas, *The Structure of Scientific Revolutions*, Chicago Univ. Press 1962.

Bibliography

- Laing, R.D., *The Politics of Experience*, Penguin 1969.
- Lakatos, I. & Musgrave, A. (eds), *Criticism and the Growth of Knowledge*, Cambridge Univ. Press 1970.
- Lee, S.G.M. & Mayes, A.R. (eds), *Dreams and Dreaming*, Penguin 1973.
- Le Shan, Lawrence, *Alternate Realities*, Sheldon, London 1967.
- *Towards a General Theory of the Paranormal*, Parapsychology Foundation, New York 1969.
- *The Medium, the Mystic and the Physicist*, Turnstone, London 1974.
- *Clairvoyant Reality*, Turnstone, London 1980.
- *Medium, Mystic, Physicist*, Arkana (Penguin) 1995.
- Lewin, Roger, *Complexity*, Dent, London 1993.
- Lewis, John (ed.), *Beyond Chance and Necessity*, Garnstone, London 1974.
- Lewis, Thomas, *The Medusa and the Snail*, Viking, New York 1979; Bantam, London 1980.
- Lewontin, R.C., *The Genetic Basis of Evolutionary Change*, Columbia Univ. Press 1974.
- Littleton, Edith, *Our Superconscious Mind*, Phillip Allan, London 1931.
- Long, M.F., *The Secret Science Behind Miracles*, De Vorss, Calif. 1981.
- Longuet-Higgins, H.C., Kenny, A.J.P., Lucas, J.R. & Waddington, C.H., *The Nature of Mind*, Edinburgh Univ. Press 1972.
- Lorimer, D., *Survival?: Body, Mind and Death in the Light of Psychic Experience*, Routledge & Kegan Paul, London 1984.
- Lucas, J.R., *The Freedom of the Will*, Oxford Univ. Press 1989.
- Lycan, W.G., *Consciousness*, MIT Press, Cambridge MA 1987.
- *Consciousness and Experience*, MIT Press, Cambridge MA 1996.
- Mack, J.E., *Abduction: Human Encounters with Aliens*, Simon & Schuster, London 1994.
- MacKenzie, A., *Hauntings and Apparitions*, Heinemann, London 1982.
- *The Seen and the Unseen*, Weidenfeld & Nicholson, London 1987.
- Malcolm, M., *Dreaming*, New York 1962.
- Maple, E., *The Realm of Ghosts*, Pan, London 1967.
- Marais, E., *The Soul of the White Ant*, London 1937; Penguin, London 1973.
- Marsden, S., *Psychic Experience for You*, Aquarian, Wellingborough 1983.
- Martino, E. de, *Primitive Magic: The Psychic Powers of Shamans and Sorcerers*, Bay Books, N.S.W. Australia; Prism, London 1990.
- McCreery, Charles, *Science, Philosophy and ESP*, Faber, London 1967; Institute of Parapsychological Research, Oxford 1978.
- *Psychical Phenomena and the Physical World*, Hamish Hamilton, London 1973.
- Mayr, E., *Animal Species and Evolution*, Harvard Univ. Press 1963.
- McClure, Kevin, *The Evidence for Visions of the Virgin Mary*, Aquarian, Wellingborough 1983.
- Medawar, Sir Peter, *The Strange Case of the Spotted Mice and Other Classic Essays in Science*, Oxford Univ. Press 1966.

- *The Limits of Science*, Oxford Univ. Press 1984.
- Metzinger, T. (ed.), *Conscious Experience*, Imprint Academic, London 1995.
- Meyrink, Gustav, *Das Haus zur Letzten Laterne*, Langen-Müller, Munich 1973.
- Michell, J. & Rickard, J.M., *Phenomena: A Book of Wonders*, Thames & Hudson, London 1977.
- Milton, R., *The Facts of Life: Shattering the Myths of Darwinism*, Fourth Estate, London 1992; Corgi, London 1993.
- Mishlove, G., *The Roots of Consciousness*, Random House, New York 1975.
- Mitchell, E.D., *Psychic Exploration*, Putnam, New York 1974.
- Mitchell, Janet Lee, *Out-of-Body Experiences*, Aquarian, Wellingborough 1984.
- *Out-of-Body Experiences: A Handbook*, Ballantine, New York 1987.
- Moberley, Charlotte & Jourdain, Eleanor, *An Adventure*, Macmillan, London 1911.
- Monod, Jacques, *Chance and Necessity*, Collins, London 1972.
- Monroe, R.A., *Journeys Out of the Body*, Doubleday, New York; Souvenir, London 1972.
- Moody, R.A., *Life After Life*, Bantam, New York 1975; Corgi, London 1977.
- *Reflections on Life After Life*, Corgi, London 1978.
- Moser, Fanny, *Spuk: Irrglaube oder Wahrglaube?* Baden bei Zurich 1950.
- Moss, Thelma, *The Probability of the Impossible: Scientific Discoveries and Explorations of the Psychic World*, Tarcher, New York 1974; Routledge & Kegan Paul, London 1976.
- Mountcastle, V.B. (ed), *Interhemispheric Relations and Cerebral Dominance*, Johns Hopkins Press, Baltimore 1976.
- Mukunda, N., *The World of Bohr and Dirac: Images of Twentieth Century Physics*, Wiley-Eastern, New Delhi 1993.
- Muldoon, S.J. & Carrington, H., *The Projection of the Astral Body*, Rider, New York 1968.
- *The Phenomenon of Astral Projection*, Rider, New York 1969.
- Murphy, Gardner, *Challenge of Psychical Research: A Primer of Parapsychology*, Harper, New York 1961.
- & Ballou, R.O. (eds), *William James on Psychical Research*, Chatto & Windus, London 1961.
- Myers, F.W.H., *Human Personality and Its Survival of Bodily Death* (2 vols), Longman, London 1903; University Books, New York 1961.
- Naddair, Kaledon, *Keltic Folk and Faerie Tales*, Hutchinson, London 1987.
- *The Shaman and Ritual Drumming*, Keltia Publications, Edinburgh 1986.
- Nahal, C. (ed.), *Drugs and the Other Self*, Harper & Row, New York 1971.
- Nasr, Seyyed Hossein, *Man and Nature: The Spiritual Crisis of Modern Man*, Allen & Unwin, London 1968.
- Needham, Joseph, *Order and Life*, Yale Univ. Press 1936; MIT Press 1968.
- Needleman, Jacob, *A Sense of the Cosmos*, Arkana, London 1988.

Bibliography

- Newell, A., *Unified Theories of Cognition*, Harvard Univ. Press, Cambridge MA, 1990.
- Noakes, B., *I Saw a Ghost*, Weidenfeld & Nicholson, London 1986.
- Noll, R., *The Jung Cult: Origins of a Charismatic Movement*, Princeton Univ. Press 1994; Fontana, London 1996.
- O'Connor, D.J., *Free Will*, Doubleday, New York 1971.
- Oesterreich, T.K., *Possession, Demoniactal and Other*, Kegan Paul, Trench, Trübner & Co., London 1930.
- Ornstein, R. E., *The Psychology of Consciousness*, Freeman, New York 1972.
- (ed.), *The Nature of Human Consciousness: A Book of Readings*, Benjamin, Reading MA 1973.
- Ortega y Gasset, José, *Psychological Investigations* (transl. Garcia-Gomez, J.), 1916; Norton, New York & London 1987.
- Osborn, A.W., *The Future is Now: The Significance of Precognition*, University Books, New York 1961.
- Osis, Karlis, *Deathbed Observations by Physicians and Nurses*, Parapsychological Foundation, New York 1961.
- Ostrander, Sheila & Schroeder, Lynn, *Psi: Psychic Discoveries Behind the Iron Curtain*, Sphere, London 1961; 1973.
- *Handbook of Psi Discoveries*, Berkeley, New York 1974.
- Osty, Eugene, *Supernatural Faculties in Man*, Methuen, London 1923.
- Oswald, I., *Sleeping and Waking*, Elsevier, New York 1962.
- *Sleep*, Penguin 1970.
- Otto, Rudolph, *Mysticism East and West*, Macmillan, London 1932; Collier, New York 1962.
- Owen, A.R.D., *Can We Explain the Poltergeist?* Garrett, New York 1964.
- Owen, Iris M. & Sparrow, Margaret, *Conjuring Up Philip*, Harper & Row, New York 1976.
- Owen, Robert Dale, *Footsteps on the Boundaries of Another World*, Trübner, London 1860.
- *The Debatable Land Between this World and the Next*, Trübner, London 1874.
- Papadopoulos, R.K. & Saayman, G.S. (eds), *Jung in Modern Perspective: The Master and his Legacy*, Prism, London 1991.
- Papineau, D. (ed.), *The Philosophy of Science*, Oxford Univ. Press 1996.
- Pauwels, L. & Bergier, J., *Le Matin des Magiciens*, Guallimard, Paris 1960; (tr. R. Myers) *The Morning of the Magicians*, Souvenir Press, London 2001.
- Peat, F.D., *Synchronicity: The Bridge Between Matter and Mind*, Bantam, New York 1987.
- Pedlar, K., *Mind over Matter*, Methuen, London 1981.
- Penfield, W., *The Excitable Cortex in Conscious Man*, Liverpool Univ. Press 1953.
- *The Mystery of Mind*, Princeton Univ. Press 1975.

- Penrose, R., *The Emperor's New Mind*, Oxford Univ. Press 1989; Vintage, London 1990.
- *Shadows of the Mind*, Oxford Univ. Press 1994.
- & Isham, C.J. (eds), *Quantum Concepts in Space and Time*, Oxford Univ. Press 1986.
- Persinger, M.A. & Lafrenière, G.F., *Spacetime Transients and Unusual Events*, Nelson-Hall, Chicago 1977.
- Piatelli-Palmarini, M., *Inevitable Illusions: How Miracles of Reason Rule Our Minds*, Wiley, New York 1994.
- Planck, Max, *The Universe in the Light of Modern Physics*, Norton, New York 1931.
- Playfair, G., *The Indefinite Boundary*, Souvenir, London 1976.
- *This House is Haunted*, Souvenir, London 1980.
- Pollack, J.H., *Croiset the Clairvoyant*, Doubleday, New York 1964.
- Pope, K.S. & Singer, J.L. (eds), *The Stream of Consciousness: Scientific Investigations into the Flow of Human Experience*, Plenum, New York 1978.
- Popper, Sir Karl, *The Logic of Scientific Discovery*, Hutchinson, London 1969; Routledge, New York 1980.
- *Objective Knowledge: An Evolutionary Approach*, Oxford Univ. Press 1972.
- *The Myth of the Framework: In Defence of Science and Rationality*, Routledge, London 1994.
- *Knowledge and the Body-Mind Problem: In Defence of Interaction*, Routledge, London 1994.
- & Eccles, J., *The Self and Its Brain*, Springer, New York 1977.
- Poundstone, W., *The Recursive Universe: Cosmic Complexity and the Limits of Scientific Knowledge*, William Morrow, New York 1985.
- Pratt, J.G., *Parapsychology: An Insider's View of ESP*, Doubleday, New York 1964.
- , Rhine, J.B., Smith, B.M., Stuart, C.E. & Greenwood, J.A., *Extra-Sensory Perception After Sixty Years*, Henry Holt, New York 1940.
- Pribram, K., *Consciousness and the Brain*, Plenum, New York 1976.
- Priestley, J.B., *Man and Time*, Aldus, London 1964.
- Prince, M., *The Dissociation of a Personality*, Longmans, Green & Co., New York 1906.
- Prince, W.F., *Noted Witnesses for Psychic Occurrences*, University Books, New York 1963.
- Progoff, Ira, *Jung, Synchronicity and Human Destiny*, Julian, New York 1973.
- Randall, J.L., *Parapsychology and the Nature of Life*, Souvenir, London 1975.
- *Psychokinesis*, Souvenir, London 1982.
- Randall, N., *Life After Death*, Robert Hale, London 1975; Corgi, London 1980.
- Randi, James, *Flim-Flam: The Truth About Unicorns, Parapsychology and Other Delusions*, Lippincott & Crowell, New York 1980.
- Randles, Jenny, *The Pennine UFO Mystery*, Granada, London 1983.
- *Mind Monsters*, Aquarian, Wellingborough 1990.
- *Abduction*, Robert Hale, London 1988.

Bibliography

- & Hough, Peter, *The Complete Book of UFOs: Fifty Years of Alien Contacts and Encounters*, Judy Piatkas, London 1994.
- Rawcliffe, D.H., *The Psychology of the Occult*, Derricke Ridgeway, New York 1952; republished as *Illusions and Delusions of the Supernatural and the Occult*, Dover, New York 1959.
- Reed, Graham, *The Psychology of Anomalous Experience*, Prometheus, Buffalo NY 1988.
- Rhine, J.B., *Extra-Sensory Perception*, Society for Psychical Research, Boston MA 1934.
- *New Frontiers of the Mind*, 1937; Penguin 1950.
- *The Reach of the Mind*, Penguin 1954.
- Rhine, Louisa, *Hidden Channels of the Mind*, Macmillan, New York 1961.
- *Mind Over Matter*, Macmillan, New York 1970.
- *The Invisible Picture*, Scarecrow, Metuchen NJ 1981.
- Richet, Charles, *Thirty Years of Psychical Research*, Collins, London 1923.
- Rimmer, John, *The Evidence for Alien Abductions*, Aquarian, Wellingborough 1984.
- Robert, Jane, *The Seth Material*, Prentice-Hall, NJ 1970.
- Rogo, D. Scott, *Phantoms: Experiences and Investigations*, David & Charles, Newton Abbot, Devon 1976.
- *Life After Death: The Case for the Survival of Bodily Death*, Aquarian, Wellingborough 1986.
- *Miracles: a Parascientific Inquiry into Wondrous Phenomena*, Diad, New York 1982.
- *On the Track of the Poltergeist*, Prentice-Hall, NJ 1986.
- *Psychic Breakthroughs Today*, Aquarian, Wellingborough 1987.
- Roll, W.G., *The Poltergeist*, Doubleday, New York 1972; New American Library, New York 1973; Wyndham, London 1976.
- *et al.* (eds), *Researches in Parapsychology*, Scarecrow, Metuchen, NJ 1974.
- Rollo, Ahmed, *Thr Black Art*, Long, London 1936; Jarrold, London 1968; Senate, London 1994.
- Rosenblueth, A., *Mind and Brain: A Philosophy of Science*, MIT Press, Cambridge, MA 1970.
- Rosenfield, I., *The Strange, Familiar and Forgotten: An Anatomy of Consciousness*, Knopf, New York; Picador, London 1992.
- Rostand, J., *Evolution*, Prentice-Hall, London 1962.
- Rouhier, A., *La Plante, qui Fait les Yeux Emergeillés, le Peyote*, Doin, Paris 1927.
- Russell, Bertrand, *The Analysis of Mind*, Allen & Unwin, London 1921; Routledge, London 1992.
- *An Enquiry into Meaning and Truth*, Allen & Unwin 1940; Routledge, London 1993.
- *Human Knowledge: Its Scope and Limits*, Allen & Unwin 1948; Routledge, London 1993.

- Russell, George (A.E.), *The Candle of Vision: Inner Worlds of the Imagination*, Prism, London 1991.
- Ryle, Gilbert, *The Concept of Mind*, Hutchinson, London 1949; Penguin 1963.
- Sabom, M.B., *Recollections of Death: A Medical Investigation*, Harper & Row, New York 1982.
- Sacks, Oliver, *Thinking about Thinking*, Picador, London 1994.
- Sagan, Carl, *The Demon-Haunted World: Science as a Candle in the Dark*, Headline, London 1996.
- Saltmarsh, H.F., *Foreknowledge*, Bell, London 1938.
- *Evidence for Personal Survival from Cross-Correspondences*, Bell, London 1938.
- Satprem, Sri Aurobindo: *The Adventure of Consciousness*, Sri Aurobindo Ashram, Pondicherry 1968.
- Schilpp, P.A. (ed.), *The Philosophy of Karl Popper*, Open Court, Illinois 1984.
- Schmeidler, G. & McConnell, R., *ESP and Personality*, Yale Univ. Press 1958.
- Scholem, G., *On the Kabbalah and Its Symbolism*, Schocken, New York 1969.
- Scholtz, Wilhelm von, *Der Zufall: Eine Vorform des Schicksals*, Stuttgart 1924.
- Schrödinger, E., *Science and Humanism: Physics in our Time*, Cambridge Univ. Press 1951.
- *What is Life?* Cambridge Univ. Press 1958.
- Schul, Bill, *The Psychic Power of Animals*, Coronet, New York 1977.
- Schwenk, Theodore, *Sensitive Chaos*, Rudolph Steiner, London 1965.
- Scientific American, *The Brain*, Freeman, San Francisco 1979.
- Scientific American Readings, *Mind and Behaviour*, Freeman, San Francisco 1969.
- Scott, A., *Stairway to the Mind*, Springer, New York 1995.
- Searle, John R., *The Behavioural and Brain Sciences*, Cambridge Univ. Press 1980.
- *Intentionality*, Cambridge Univ. Press 1983.
- *The Rediscovery of the Mind*, MIT Press, Cambridge MA, 1992
- Seller, Charles E., *Miracles and Other Wonders: Inspiring and Astounding Real-Life Accounts*, Dell, New York 1994
- Shah, Idries, *Oriental Magic*, Rider & Co., London 1956; Paladin, St. Albans 1973.
- *The Secret Lore of Magic*, Frederick Muller, London 1957.
- *The Sufis*, Doubleday, New York 1964.
- Shanmugan, T.E. (ed.), *The Concept of Mind: A Symposium*, Popular Prakashan, Bombay 1972.
- Shapin, S. & Coly, L. (eds), *Psi and States of Awareness*, Parapsychology Foundation, New York 1978.
- Sheldrake, R., *A New Science of Life: The Hypothesis of Formative Causation*, Blond & Briggs, London 1981; Paladin 1987.
- *The Presence of the Past*, Collins, New York 1988.
- *Seven Experiments that Could Change the World*, Fourth Estate, London 1994.

Bibliography

- Sherman, Harold, *Your Mysterious Powers of ESP*, New American Library 1969; expanded edn. 1980.
- & Wilkins, H., *Thoughts Through Space*, Creative Age Press 1942; Master Publications, New York 1957.
- Shepherd, L. (ed.), *Encyclopedia of Occultism and Parapsychology*, Gale Research Co., Detroit 1972.
- Shirley, R., *The Mystery of the Human Double*, University Books, New York 1962.
- Sidgwick, Eleanor, *Phantoms of the Living*, University Books, New York 1962.
- Siegel, R.K., *Fire in the Brain: Clinical Tales of Hallucination*, Dutton, New York 1992.
- & West, L.J. (eds), *Hallucinations: Behaviour, Experience and Theory*, Wiley, New York 1975.
- Simpson, G.G., *The Meaning of Evolution*, Oxford Univ. Press 1950.
- *This View of Life*, Harcourt Brace, New York 1964.
- Sinclair, Upton, *Mental Radio*, Werner Laurie, London 1930.
- Sitwell, Sacheverell, *Poltergeists*, Faber & Faber, London 1940.
- Skinner, B.F., *Behavior of Organisms: An Experimental Analysis*, Appleton-Century-Crofts, New York 1938.
- *Science and Human Behavior*, Macmillan, New York 1953.
- *About Behaviourism*, Cape, London 1974.
- Smith, A., *The Mind*, Viking, New York 1984.
- Smith, Alison J., *Immortality: The Scientific Evidence*, Signet, New York 1954.
- Smith, Susy, *The Enigma of Out-of-the-Body Travel*, Garrett, New York 1965.
- Soal, F.G. & Bateman, F., *Modern Experiments in Telepathy*, Faber, London 1954.
- Society for Psychical Research, *Census of Hallucinations*, SPR, London 1894.
- Sommerhoff, G., *Logic of the Living Brain*, Wiley, London 1974.
- Spence, Lewis, *Encyclopaedia of the Occult*, Routledge, London 1920; Bracken Books, London 1988.
- Spencer, John, *The UFO Encyclopedia*, Headline, London 1991.
- & Evans, Hilary (eds), *Phenomenon*, Futura, London 1988.
- & Spencer, Anne, *The Encyclopedia of Ghosts and Spirits*, Headline, London 1992.
- Stannard, R., *Science and Wonders: Conversations about Science and Belief*, Faber, London 1996.
- Stearn, Jesse, *Edgar Cayce: The Sleeping Prophet*, Doubleday, New York 1967.
- Stevens, P.S., *Patterns in Nature*, Penguin 1976.
- Stevenson, Ian, *Twenty Cases Suggestive of Reincarnation*, 2nd edn. Univ. of Virginia Press 1974.
- *Cases of the Reincarnation Type* (3 vols), Univ. Virginia Press 1975-80.
- Story, R.D. (ed.), *The Encyclopedia of UFOs*, New English Library, London; Doubleday, New York 1980.
- Strieber, Whitley, *Communion*, Hutchinson, London 1987.
- *Transformation*, Hutchinson, London 1989.
- Sutherland, Stuart, *Irrationality: The Enemy Within*, Penguin 1994.

- Suzuki, Daisetsu T., *Mysticism, Christian and Buddhist*, Allen & Unwin, London 1957.
— *The Zen Doctrine of No-Mind*, Rider, London 1947.
- Swann, Ingo, *Natural ESP: The ESP Core and Its Raw Characteristics*, Bantam, New York 1987.
- Talamonti, Leo, *Forbidden Universe: Mysteries of Time and Space*, Futura, London 1976.
- Talbot, M., *Beyond the Quantum*, Macmillan, London 1987.
- Targ, R. & Puthoff, H., *Mind Reach: Scientists Look at Psychic Ability*, Delacorte, New York 1977.
- Tart, C.T., *Altered States of Consciousness*, Wiley, New York 1969.
— *States of Consciousness*, Dutton, New York 1975.
— *Psi*, Dutton, New York 1977.
— *Mind at Large*, Praeger, New York 1979.
— (ed.), *Transpersonal Psychologies*, Harper & Row, New York 1975.
- Taylor, J.G., *Superminds*, Macmillan, London 1975.
— *Science and the Supernatural*, Temple Smith, London 1980.
- Thigpen, C.H., & Checkley, H.M., *The Three Faces of Eve*, Secker & Warburg, London 1957.
- Thompson, D'Arcy W., *On Growth and Form*, Cambridge Univ. Press 1917; abridged edn. 1961.
- Thompson, K., *Angels and Aliens: UFOs and the Mythic Imagination*, Addison-Wesley, New York 1991; Ballantine 1993.
- Thouless, R.H., *Experimental Psychical Research*, Penguin 1963.
- Thurston, H.J., *The Physical Phenomena of Mysticism*, Burns, Oates & Washbourne, London 1952.
— *Ghosts and Poltergeists*, Regnery, Chicago; Burns, Oates & Washbourne, London 1953.
- Tizané, E., *Sur la Piste de l'Homme Inconnu*, Amiot-Dumont, Paris 1951.
- Tolman, E.C., *Purposive Behaviour in Animals and Man*, Appleton-Century-Crofts, New York 1932.
- Tyrrell, G.N.M., *Apparitions*, Collier, New York 1963.
- Ullman, M., Krippner, S. & Vaughan, A., *Dream Telepathy*, Turnstone, London 1973.
- Unamuno, Miguel de, *The Tragic Sense of Life*, Macmillan 1921; Fontana, London 1962.
- Underhill, Evelyn, *Mysticism*, New English Library, London 1955; Oneworld, Oxford 1993.
- Underwood, P., *The Gazetteer of British Ghosts*, Souvenir, London 1971.
— *The Complete Book of Dowsing and Divining*, Rider, London 1980.
- Vallée, Jacques, *Anatomy of a Phenomenon*, Regnery, Chicago 1965.

Bibliography

- *Passport to Magonia: From Folklore to Flying Saucers*, Neville Spearman, London 1970; Tandem 1975; expanded version published as *Dimensions: A Casebook of Alien Contacts*, Sphere, London 1985.
- Van Eeden, F., *A Study of Dreams*, Society of Psychical Research, London 1913.
- *The Bride of Dreams*, Mitchell Kennerly, New York 1918.
- Van Over, R., *Psychology and Extra-Sensory Perception*, New American Library, New York 1972.
- Vaughan, A., *Incredible Coincidences: The Baffling World of Synchronicity*, Signet, London 1980; Ballantine 1989.
- Velmans, M., *The Science of Consciousness*, Routledge, London 1996.
- Venkataraman, G., *Quantum Revolution III: What is Reality?* Hyderabad Univ. Press, India 1994.
- Von Wright, G.H., *Causality and Determinism*, Columbia Univ. Press, New York & London 1974.
- Waddington, C.H. (ed.), *Towards a Theoretical Biology, I: Prolegomena*, Edinburgh Univ. Press, and Aldine, New York 1968.
- (ed.), *Towards a Theoretical Biology, II: Sketches*, Edinburgh Univ. Press and Aldine, New York 1969.
- (ed.), *Towards a Theoretical Biology, III: Drafts*, Edinburgh Univ. Press, and Aldine, New York 1970.
- Wallace, Alfred Russell, *The Scientific Aspect of the Supernatural*, London 1866.
- *On Miracles and Modern Spiritualism*, London 1875.
- Wallis, Roy (ed.), *On the Margins of Science*, Keele Univ. Press 1978.
- Walter, W. Grey., *The Living Brain*, Norton, New York 1953.
- Walters, Ed & Walters, Frances, *The Gulf Breeze Sightings*, Avon, New York 1989.
- *UFO Abductions in Gulf Breeze*, Avon, New York 1994.
- Warner, R. & Szubka, T., *The Mind-Body Problem: A Guide to the Current Debate*, Blackwell, London 1995.
- Watson, Ian, *The After Death Experience*, Corgi, London 1987.
- Watson, J.B., *Behavior: An Introduction to Comparative Psychology*, Holt, Rhinehart & Winston, New York 1914.
- *Psychology from the Standpoint of a Behaviorist*, Lippincott, Philadelphia 1919.
- *Behaviorism*, Norton, New York 1924; Chicago Univ. Press 1924.
- Watson, Lyall, *Supernature*, Hodder & Stoughton, London 1973.
- *The Romeo Error*, Hodder & Stoughton, London 1974.
- *Gifts of Unknown Things*, Hodder & Stoughton, London 1976.
- *Lifetide*, Hodder & Stoughton, London 1979.
- *Earthworks*, Hodder & Stoughton, London 1986; republished as *Dreams of Dragons*, 1987.
- *Beyond Supernature*, Hodder & Stoughton, London 1988.
- Watson, P., *Twins: An Uncanny Relationship?* Viking, New York 1982.

- West, D.J., *Psychical Research Today*, Penguin 1962.
- West, L.J. (ed.), *Hallucinations*, Grune & Statton, New York 1962.
- Wheeler, J.A. & Zurek, W.H. (eds), *Quantum Theory and Measurement*, Princeton Univ. Press 1983.
- White, Rhea A. (ed.), *Surveys of Parapsychology*, Scarecrow, Metuchen NJ 1976.
- White, T., *The Sceptical Occultist*, Century, London 1994.
- Whitehead, A.N., *Science and the Modern World*, Cambridge Univ. Press 1925.
- Wigner, E.P., *Symmetries and Reflections*, MIT Press, Cambridge MA 1967.
- *The Logic of Personal Knowledge*, Routledge & Kegan Paul, London 1961.
- Wiley, R., *Modern Dowsing*, Esoteric Publications, Arizona 1976.
- Wilson, Colin, *The Occult*, Hodder & Stoughton, London 1971.
- *Mysteries*, Hodder & Stoughton, London 1978.
- *Poltergeist!* New English Library, London 1981.
- *The Psychic Detectives*, Pan, London 1984.
- *Afterlife*, Harrap, London 1985.
- *Beyond the Occult*, Corgi, London 1988.
- *The Mammoth Book of the Supernatural*, Robinson, London 1991.
- & Wilson, Damon, *The Encyclopedia of Unsolved Mysteries*, Harrap, London 1987.
- Wilson, Ian, *In Search of Ghosts*, Headline, London 1995.
- Wolman, B.B. (ed.), *Handbook of Parapsychology*, Van Nostrand, New York 1977.
- Wolstenholme, G.E.W. & Millar, E.C.P. (eds), *Ciba Foundation Symposium on Extrasensory Perception*, Churchill, London 1956.
- Worral, A. & Worral, O., *The Gift of Healing*, Harper & Row, New York 1958.
- Wundt, Wilhelm, *Grundzüge der physiologische Psychologie* (3 vols), Leipzig 1903.
- Yeats, W.B., *A Vision*, Macmillan, London 1937; 1986.
- *The Celtic Twilight: Myth, Fantasy and Folklore*, 1893; Prism, London 1991.
- *Mythologies*, Macmillan, London 1959; abridged edn. *The Mystic Rose*, Macmillan 1982.
- York, M., *Research in Parapsychology*, Scarecrow, Metuchen NJ 1976.
- Zollschan, G.K., Schumaker, J.F. & Walsh, G.F. (eds), *Exploring the Paranormal: Perspectives on Belief and Existence*, Prism Press, Bridport Dorset 1989; Prism, London 1991.