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**The Dominance of the Physicalist-Reductionist Approach to the Study of
Consciousness and Its Evolution: The Case for a Non-physicalist Paradigm**

A thesis presented in partial
fulfilment of the requirements for the
degree of

Master of Arts in Psychology at Massey University

Peter Anthony Jackson

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To Kathy

for her love and enthusiasm
and for believing I could do it

ABSTRACT

In this thesis it is argued that the dominant physicalist-reductionist view in psychology has hindered the study of consciousness and its evolution. The thesis begins with an overview of the physicalist-reductionist position, from a philosophical viewpoint. The weakness of this position is exposed in that matter can be viewed not as a physical substance, but as the derivative of a non-physical realm. This is argued by using the theory of David Bohm, who postulated the existence of an implicate order (hidden from the senses) and an explicate order (the sensory realm). Bohm's reasoning is explored and justified, where his theory is shown to be the way to reconciling the difficulties faced by quantum mechanics and relativity theory. Using Bohm's implicate-explicate notion as a basis, an implicate-explicate model of the evolution of consciousness is developed. This model is able to deal with biological evolutionary factors, and not simply with the evolution of consciousness. This is because the model assumes that biological forms evolved as a result of the interaction between the implicate and explicate orders. In this model, evolution is seen as the unfolding of what lies implicate, which then becomes explicate. The earliest stages of this unfolding were automatic, and led to increasingly complex physical, chemical, then biological structures. A stage was reached where biological structures gave rise to sufficiently complex neural structures which, in turn, permitted consciousness to appear. In this model, consciousness is a very high order explicate of a special region within the implicate order, which is called Mind. Thus, the evolution of consciousness is the result of the unfolding of Mind. The model shows that consciousness is an active factor in the further evolution of biological forms. The notion of consciousness is explored and a variety of theories of consciousness are reviewed and critiqued, where these are examined in the light of the implicate-explicate model. This model is then used to explore the way consciousness evolves through the infrahuman life forms to the human form. Palaeoanthropological evidence is used to justify the claim that

consciousness has evolved, with a special focus on primate evolution, and on the critical phase of transition from proto-human to truly human consciousness. In this, the acquisition of speech is seen as crucial, where the implicate-explicate model offers an explanation for this acquisition. The notion of psychological paradigms is explored, and a set of paradigms delineated, where these are located along a spectrum of the relevance of consciousness to any given paradigm. The relevance spectrum is related to the implicate-explicate model as a metaparadigm. This is used to reveal the strengths and limitations of the various paradigms. The implicate-explicate model shows that present-day humans have reached an impasse in the evolution of their consciousness. A means to overcoming this is suggested, and the next stage in the evolution of consciousness that might arise is speculated upon.

PREFACE

The topic of consciousness and its evolution has long fascinated me. This fascination was a major reason for studying psychology at the undergraduate and graduate levels, where I hoped to find some answers to the mystery of consciousness and its evolution. While I found answers to many other things about human nature and behaviour, I found psychology (with a few notable exceptions) had little to say on the topic of the evolution of consciousness. As far back as the 100 level papers, the absence of the *psyche* in psychology concerned me. This concern was aggravated by the relative silence in psychology regarding the evolution of consciousness and the dominance within this discipline of physicalist-reductionist thinking. I had, perhaps naively, thought that psychology was the one viable agent for change. I had seen it as the one branch of science that could shed light on human nature, its purpose and its possible future. I have since had some of the naivety knocked out of me, but my faith in psychology as an agent for change lingers on.

A breakthrough in my study of consciousness came from my readings in a field far removed from psychology. This field was that of physics, quantum mechanics in particular, in which the consciousness of observers plays a crucial role. Having given the paradoxes of quantum mechanics some considerable thought, and having been deeply impressed by the work of David Bohm, a theoretical physicist, I began to see why the topic of consciousness was being avoided by psychology, but also saw the possibility of a way forward to a better understanding of it. Moreover, in the work of Bohm, I saw the basis of the possibility of developing a model of consciousness and its evolution. Doing a special 400-level topic on the evolution of consciousness with Dr Dave Clarke

(Department of Psychology, Massey University) firmly cemented my interest in this subject where, during that course, the idea to write this thesis arose.

The remnant of my faith in psychology as an engine for change has led me, perhaps egotistically, to believe that an area of contribution that I could make would be to edge the psyche back into psychology, even if through the back door. This prompted me to write this thesis in the hope that it might provoke thought and suggest possible ways forward to a wider interest in and deeper understanding of consciousness and its evolution. Were this hope even vaguely realised, then one small contribution to a needed paradigm shift might have been made.

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I wish also to acknowledge my indebtedness to Professor David Bohm, without whose years of brilliant work in the field of theoretical physics, my thesis would have had no empirical basis. I believe that Bohm's ideas are as far ahead of their time today, as were Einstein's when the Newtonian paradigm still held sway. I have widely used (and perhaps abused) his ideas, and pushed them into areas he might not approve of.

I thank Ian Timperly for the highly professional art-work he executed in the illustrations used in this thesis.

I also want to thank Miles, my ten-year old son, for all his patience and understanding during those times when his dad locked himself away in his study.

Most of all, I want to thank Kathy, the light of my life, whose faith in me kept me going during some rather dark moments. She listened with interest to my ramblings, lifted me out of depression, helped me break my log-jams and has read every line of this fairly long thesis.

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GLOSSARY OF ABBREVIATIONS

A. afarensis: Australopithecus afarensis

A. africanus: Australopithecus africanus

AI: Artificial Intelligence

BP: Before the present

CAI: Computer Assisted Instruction

CNS: Central Nervous System

E: Explicate Order

E-mail: Electronic mail

He: Homo erectus

Hh: Homo habilus

Hs: Homo sapiens

Hsn: Homo sapiens neanderthalensis

Hss: Homo sapiens sapiens

I: Implicate Order

I-E: Implicate-Explicate

LA: Law of Approximation to an Ideal

LC: Law of Increasing Complexity

LE: Local Environment

LU: Law of Unfolding

S: Shape (at birth)

S': Shape (at death)

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CHAPTER 1: INTRODUCTION

This thesis addresses itself to what I regard as the extreme imbalance that exists in the current scientific view of consciousness and its evolution. The imbalance is created by a strong bias toward a physicalist-reductionist view of consciousness. This places a severe constraint on the view of the nature of consciousness, and rules out any other view or explanation. In this context, the compound term *physicalist-reductionist* describes a philosophical position which asserts that there is only matter in some state or another (it may be fields, subatomic particles, or tangible substance) and that, in the final analysis, all animal behaviour (including that of humans and their societies) is reducible to the laws that govern matter (usually thought to be that of classical physics). This physicalist-reductionist account has served well the physical sciences (such as, physics, geology and astronomy) in the sense that they have achieved a high degree of prediction and control. However, I argue that this view is misplaced in the human sciences (eg, psychology and sociology).

A BRIEF HISTORY OF PHILOSOPHICAL PHYSICALISM

In fairness to the viewpoint I call *physicalist-reductionist*, its development and basic tenets should be made available to my reader, so that an informed judgement can be made in regard to the validity of the arguments of both sides. To this end I give a brief history of the development of physicalism.

In the development of the physicalist-reductionist viewpoint, we can identify three separate stages: Identity Theory, Functionalism and Eliminativism.

Identity theory

The attractiveness of Physicalism is that it avoids the difficulties inherent in having a dualistic scheme where there are mental things and physical things. That is, it makes life very simple if every thing in the world, including humans and their complex behaviours, can be reduced to one ultimate class of things (matter of some form). Put more formally, this argument goes that there is nothing we can say about minds that is not already exhausted in

claims about the central nervous system. In this approach we are saying that there is only the one thing, physical matter, which we refer to accurately with physical terms and which we refer to misleadingly with mentalistic terms. That is, the essential Physicalist claim is that there is no other thing but physical matter, which mental terms refer to.

The vindication of this claim was, and still is, the goal of Physicalism, and it strongly motivated the early Physicalists. In pursuing this goal, the early Physicalists discovered (perhaps unearthed) what has become known as *Leibniz Law*. This Law was not formally stated by Leibniz, but was implicit in his mathematico-philosophical writings. The Law can be stated as: *if one thing is identical to another then anything that is true of the one must also be true of the other*.

The great value of Leibniz Law is that it makes it very clear that if we wish to equate two separate things with an equals sign, then the property lists of each of the two things must be identical. That is, even though we are using different labels for the two things (say, x and y), they are identical if the listings of their individual properties are identical. If this is true, then we can validly say $x = y$.

It was the application of this line of reasoning that led Descartes to his dualistic view of the mind-body problem. He said that the properties of minds are quite obviously different from those of the central nervous system (eg, the sensation of pain is quite different to the firing of certain clusters of neurons). Descartes said that mental states are conscious, private, non-spatial and indivisible, whereas physical states are non-conscious, public, spatial and divisible. When viewed in this way, there can be no Leibnizian identity because the property lists are clearly different.

The early Physicalists saw the truth in Descartes basic argument. They realised that if one applied Leibniz Law down at the level of specific sensations and given clusters of neurons then, according to that law, their case was hopeless. They saw that the power of Leibniz Law

lay in providing the means of checking for a true identity, and that if they were to obtain this condition in regard to the mind-body issue, they needed to look above the level of specific sensations and specific neurons. They saw that their earlier claim that "The mind is nothing over and above the central nervous system" was an unsafe route to follow. In fact, it became obvious that the only way to meet the Leibnizian Identity test was at the level of an entire person. Thus, they saw that the property lists were identical only when one said that a person experiencing some state (x) had a brain that was in some state (y). In this, one can legitimately say that $x = y$.

However, it was this perfectly logical application of Leibniz Law by these early Physicalists that led to a crisis in Identity Theory. While Leibniz Law seemed to have come to the rescue of Physicalism, it also enabled the opposition to formulate objections to the classical notion of identity. In fact, three major objections to classical identity theory were highlighted. The first of these had been effectively raised by Descartes, who said that the property list of mental things was not identical to that of physical things. To give them credit, as stated above, the Physicalists saw the truth in this, and worked to overcome it. The other two major objections were not so readily overcome. The first is that humans have a strong sense of the privacy of their minds, and that their minds are their own. This is known as the *first person* objection, where Classical Identity Theory leaves this something out. The second objection is that Identity Theory is species-chauvinistic in that it insists that only creatures with brains can have mental states, because it insists that mental states and brains are identical.

Taken far enough, this final objection to identity theory not only insists that other forms of life (eg non carbon-based) could have mental states, but that we cannot even restrict mental states to structures per se. The way out is to identify a given mental state with a functional state, which state could be realised in any number of structures or non-structures. This final objection to classical identity theory led on to Functionalism.

Functionalism

There are three key ideas underlying the functionalist view. Firstly, there is a distinct difference between a functional description and a structural description. In computer science, this difference is captured by the difference between, say, a hardware circuit diagram of the central processor and a listing of the program code. The latter says nothing about the structures it might use to get things done, and the former says nothing about the processes that might occur within the described structures. Secondly, the functional descriptions can be hierarchically arranged, with lower-order functions nested within higher-order ones. For example, the organisational chart of a company is hierarchical in that it shows the Chief Executive Officer at the top, various senior executives at the next level down who head certain functions such as corporate services and human resources, then levels of middle management, and finally those who report directly to these managers. The third idea is that, if the lowest level of such a hierarchy consists of elements so simple that they are purely mechanistic, then physicalism is vindicated.

Combining these ideas enables us to correlate mental stuff with the functioning of the whole. In this scheme, identity statements are still relevant, but become more subtle. In this case, where we are equating a functional device (say a text manipulation device) with a structural device (say, a personal computer), the function (text manipulation) can be carried out by a number of different structures (knife and woodblocks, ball-point, paper and scissors, and a personal computer using wordprocessing software). That is, we are saying in our *identity* statement that in this case that specific function is carried out by this specific structure, thus: *a personal computer is a symbol cruncher*.

When we get to human examples, it gets even more complex because, in the Cartesian tradition, the structures that have the function of, say, concept-maker or idea-abstracter are mental structures existing in a mental space. But, the functionalist disagrees, and argues that, in the end, there is an identity between mental states (functions) and physical structures (eg, a human brain). That is, these specific functions of abstracting concepts, say, is carried out by the specific structure of a neocortex, thus: *thinking is the firing of neurons in the neocortex*.

While classical functionalism was a great advance on classical identity theory, it still had problems. In particular, any mental state or process has a subjective feel to it (see the first person objection), and it's hard to see where a subjective element comes into the structuralist story. For example, pain is not a good piece of structure, nor is it any better as a function. Such things as pain just happen and are phenomenal. That is, events do not figure in the function-structure model.

Another problem is that of beliefs and propositional attitudes (eg, worries, fears, hopes, regrets etc..). Here are three such propositional attitudes:

(a) While I am typing this, I worry that the right keys will be missed being hit by my fingers.

(b) While I am typing this, I worry that my fingers will miss hitting the right keys.

(c) While I am typing this, I worry that the keys will miss being hit by the right fingers.

The problem is that we know that (a) and (b) are the same, and that (b) and (c) are different propositional attitudes. That is, (a) and (b) tell the reader that my worry concerns getting my fingers to the keys I really want to get them to, whereas in (c) my worry is about the keys and their sense of loss. We know this ahead of any application of a rule of structural and or functional identity, and especially ahead of any neurophysiological research. We know they are different propositional attitudes (ie, different functional states) purely only on the basis of the *grammar of English*. But this is not how identity or non-identity of physical states or functions is supposed to be determined on any basically physicalist-reductionist stance. We are supposed to look at *physical things*, not at grammar, for such decisions.

This is a problem for physicalism in general. For identity theory, the problem is that we can determine too many identities of structural states non-empirically (ie, non-physically). For functionalism, we can determine too many identities of functional states non-empirically (ie, non-physically). And, as we shall see, for the next view, eliminativism, the problem is how could questions of syntax and semantics even get a grip, if all there are are purely physical neurological events and processes.

Eliminativism

Beyond functionalist physicalism, there arose an eliminativist version, usually called Eliminativist Materialism. This approach is based on the notion that science moves forward by ditching the old as it takes on the new (a dubious and simplistic view, as Kuhn, 1962, has shown). Thus, if there are only brains, and thereby no minds, then our ways of psychologically speaking (called *Folk Psychology*) are meaningless and should be dropped.

Basically, what the eliminativist is saying is that any attempt to retain the theoretical terms of the Cartesian theory of mind, or attempts to retain our everyday psychological ways of describing human behaviour, have no value. Rather than retain the earlier notions and then try to squeeze them into a workable identity equation (in which the Folk Psychological terms go on one side of the equation, and neurological terms go on the other side), the eliminativist argues that we do not need an identity equation in the first place, because it causes so much confusion.

This is more than simply changing the kinds of explanations that are offered in a new theory. It means changing the very phenomena and the ways of identifying these phenomena which the new theory explains. The eliminativist argues that with any new theory, we do not try to hang on to the previous ontological entities and processes. Instead, we give a new explanation of their properties and relationships. That is, we completely redescribe the very phenomena which we take the new theory to be explaining. The eliminativist believes that once neuroscience reaches full maturity, we will no longer think of the phenomena which are

genuinely there and which have a real explanation in any of the terms which we now use, as inherited from our outmoded theories.

To summarise, from the above discussion, we can see that Eliminativism is a way around trying to keep mentalistic expressions and yet ditch minds. You get rid of the lot because any attempt to hang on to the Cartesian mode (or the Folk Psychological mode) of expression has no meaning. In this approach, the notion of $x = y$ is dropped as irrelevant because we are dumping the old Cartesian referent and not identifying two existently real things as with an equals sign. That is, x has no real existence or properties that science can determine, so it is completely replaced by expressions of the new theory. Thus, there are no X s, only Y s. This gets around the identity issue in the Leibniz and functional senses. However, to take this view to its logical conclusion means being able to drop the old vocabulary and replace it with the new scientifically approved vocabulary. This is done, because the old modes are regarded as containing no ontological truths, and that we retain them only through linguistic stubbornness. However, the chunk of the language we would have to drop is so large that the exercise might become absurd.

Eliminativism has struggled with the notion of the privacy of thought and how practically one could clean up the language to eliminate Folk Psychology. From these respective struggles, a spectrum emerges. At one end of this spectrum elimination is valid and at the other functionalism is valid. In the battle between the two, much depends on the findings of neuroscience and cognitive psychology.

Contemporary developments

The contemporary physicalist scene has changed considerably from that of the 1950s to 1970s. Physicalists have learned from the lessons of classical identity theory and functionalism. Essentially, science doesn't work by either *reducing* individual x s to y s or *replacing* individual x s by y s. It works by reducing entire theories (where x s dominate) to new theories (where y s dominate). Similarly with replacement.

Moreover, the progression of reduction or replacement is a matter of degree and not an either-or choice. The notion that the old theory is just a subset of the new theory is incorrect, because it is never the old theory which is reduced-replaced but a corrected version of it. The extent of this correction lies on a spectrum ranging from minor revision (at the classical identification-reduction end) to extreme changes which leave the old theory far behind (at the eliminativist-replacement end). For example, the transition from Aristotle's physics to that of Newton's entailed replacement, whereas the change from Newton to Einstein entailed reduction.

The most fundamental question for Physicalism is the extent to which there is a fit between a *Mature Neuroscience* and Folk Psychology. The real issue is whether neuroscience organises the phenomena for which it offers explanations in a way that is radically different from the way Folk Psychology organises the phenomena which it explains. This could go either way. In one direction, it might be shown that there are strong parallels between the categories of Folk Psychology and the neurological activities uncovered by neuroscience (eg, the notion of the *just noticeable difference* between two very similar weights may correspond well with the firing of certain clusters of neurons in the cortex). In this case, the fit would be good and a fair degree of reduction could occur. Conversely, there may be no significant correspondence between the two modes of explanation, so reduction cannot occur, and the Physicalist will want to ditch the Folk Psychology (for example, the clinical descriptors used for the various types of depression may have no correspondence with neuronal activity). From the Physicalist view, Folk Psychology is not worth keeping for its explanatory power because it is too dualistic in its ontological commitments, but bits of it may be found worthwhile for its conceptual organisation.

THE WEAKNESS IN THE PHYSICALIST CASE

This entire historical development of physicalism has validity only if the root assumption is valid. This root assumption is that there is basically only one kind of substance in the

universe -- physical matter (whether particulate or wave-like). This root assumption lies back of the more overt assumptions made by physicalism: that mind (and all other mental states or processes) can be seen only in terms of observable behaviours; that only science can judge what is real and what is not; that the essential causes of behaviour are neurological and physiological states.

It is arguments at the level of these three overt assumptions which have led to all the fine interplay of logic described above. But, if the root assumption is successfully challenged these arguments come to nothing. Thus, rather than get caught up in this logic chopping, I shall take a different route to undermining the physicalist bias in this thesis, by going straight to what I see as the essential weakness in the Physicalist's argument, which can be argued as follows.

The physicalist insists that while in mind and matter we have seemingly two different things, in reality they are two different ways of referring to the same thing. I point out, however, that there is nothing in this argument that shows that the physicalist's "*same thing*" must be *matter*. It could equally well be mind, or something totally other than either mind or matter. However, the physicalist insists that this same thing be matter. This insistence does not follow from the preceding logic. The strength (or possible weakness) of my thesis rests on my argument that what the physicalist calls matter, and what he/she regards as the mechanistic laws that govern this so-called substance, are ultimately intangible and arise out of something that could just as well be labelled Mind.

At this point, it is useful to summarise the overall strategy to be taken in in this thesis. I will first argue that there is a real, justifiable and valid distinction between two qualitatively different orders of reality. These are the explicate order (sensory reality) and the implicate order (hidden and non-sensory), based on the work done by the theoretical physicist David Bohm (Bohm, 1980). I will then demonstrate that philosophical physicalism does not recognise the explicate-implicate distinction. In fact, more than this, physicalism is not aware

of the distinction. Logically, this prevents physicalists from discussing anything other than physical type things, and so dramatically restricts the explanatory power of their paradigm.

It will then be argued that what is called mind is an aspect of the implicate order, and that what is called consciousness is a very high order explicate of mind (as wholly implicate). It will be further argued that the brain (human or otherwise) is wholly explicate, and of a lower explicate order than that of consciousness. I will then argue that, because all of the physicalist arguments in relation to the mind-brain issue are based solely within what I categorise as the explicate order, there is no intellectual room within physicalism to distinguish between brains and an implicate order. That is, the physicalist is forced to explain everything to do with the brain and its correlates only in terms of physical matter. This leads to the logical conclusion that the physicalist is working within the wrong category of things to be explaining the nature of mind, and hence the nature of consciousness. This category error prevents an adequate understanding and explanation of the relationship between brains, consciousness and mind. That is, while the brain is a necessary condition for an explanation of consciousness and its evolution, it is not a sufficient condition, as the physicalist maintains. This is because physicalism is ignoring the implicate order out of which the sensory world (explicate) emerges.

THE NOTION OF EVOLUTION

Because the two key terms in the title of my thesis are *evolution* and *consciousness*, it is necessary to spend some time considering these two terms and how they might come together in the phrase *evolution of consciousness*. This, of course, makes the assumption that consciousness is an entity in itself and that it does evolve. I do make this assumption and I regard the evolution of consciousness as a genuine phenomenon in nature.

When most people hear the word **evolution**, they think primarily of biological evolution and recall Charles Darwin (Darwin, 1859) as being the key figure in this field. However, the term evolution has a far wider meaning and application. I hold this view because the term

"evolution" is derived from the Latin *evolutio*, where its root meaning is that of the unrolling or unfolding of that which was wrapped or folded up. Biological evolution in the Darwinian sense has very little to do with the unfolding of something which was previously wrapped up. It has more to do with the increasing complexity of organic forms as a result of random mutation and natural selection. In saying this, I am not saying that evolutionary theory has it wrong. I am saying that biology made a poor choice of term in selecting the word "evolution".

I propose using the term "evolution" in two additional contexts, and for them I will thus give it a meaning quite different to that found in standard texts on biological evolution.

Firstly, I will use the term "evolution" in regard to *consciousness*, and for this special case give it a meaning of something unfolding, because, as I will show, the ***unfolding*** of that which was enfolded characterises the explicate order. I will later show that consciousness is a special explicate of the implicate order, and comes into being as a result of the unfolding of Mind (a very high region within the implicate order). This specific explication (of consciousness) can only occur once biological forms have reached a certain degree of unfolding, as I will show in a later chapter.

Secondly, I will use the term "evolution" in regard to *inorganic matter*. Assuming the Big Bang theory has validity, then primordial matter was far simpler than it is now, and went through some process to reach its current state. However, science restricts the application of the term "evolution" to biological forms, and does not apply it to the process whereby inorganic matter came to be as complex as it is. In my thesis, however, I will speculate that the process of unfolding the implicate order into explicate forms (the locus of David Bohm's use) applies equally well to subatomic, atomic, chemical and molecular structures. Here, I accept, I would be using the term evolution quite unusually. To avoid confusion, I will stay with the notion of an unfolding taking place within the implicate order. In this wider sense, I am referring to the development of matter from its most primordial state (the primordial singular atom, perhaps) to the present structure of the universe, which includes the atomic elements,

crystalline structures, planetary structures and the evolutionary sequence of stellar bodies. Indeed, in my view, it does not seem possible to consider biological evolution without conceding to some prior developmental process of atomic and molecular structures; and -- the point of my and Bohm's unifying category -- this developmental process is a process of unfolding the explicate from the implicate.

The distinction between non-living and living forms, and between pre-conscious and conscious forms, has never seemed very appropriate to me, in that it assumes that, at some critical level of complexity, what was previously dead matter suddenly becomes alive. If the matter that comprises cellular and other organic structures was not in some way already alive, I find it hard to see how it ever could become alive, simply by being in a more complex arrangement. Either subatomic matter is already alive in some sense, and therefore subject to some evolutionary process, or the notion of life at any level of complexity has little meaning. I speculate that what we term *Life* is inherent in all of nature, and is the manifestation of a law that operates in what Bohm (1980) calls the *holomovement* (to be dealt with in detail in Chapter 2).

In the human context, I shall define evolution as unfolding in terms of a change that is different from a purely quantitative increase (whether of individual cellular mass or numbers of humans) or individual growth-development across any given human life-span. Moreover, evolution is not necessarily a continuous process nor necessarily following some straight-line temporal law. At the elementary biological level evolution is a non-random or systematic change of gene frequency. For this reason, its effects manifest themselves in populations and not in individuals. Thus, in the biological sense, evolution seems to relate to population change, wherein a population is a collection of individual organisms. It is populations that evolve in the Darwinian sense and not individuals. However, this strictly Darwinian and reductionist biological view rejects other possibilities such as the notions of Lamarck (cited in Richards, 1987). In Chapter 3, I will explore some of these possibilities, including the

Lamarckian notion, and develop a model for the interaction between the implicate and explicate orders.

Earlier philosophical (eg, Henri Bergson), metaphysical and theological explanations of evolution have been in conflict with the Darwinian view, because they posited either an inner driving force (an **elan vital**) or some outer driving or guiding force (usually a divine teleological force). However, even thinkers with a strong metaphysical and spiritual bias, such as Pierre Teilhard de Chardin (Teilhard de Chardin, 1959) assume a Darwinian-like principle as external to the process. That is, even these thinkers do not seem to display enough faith in their inward-spiritual view, and tend to envisage evolution as a trial and error process which involves the generation of as large a variety as possible of attempts to proceed in multiple directions, where only the few of which are expected to breakthrough to higher states of evolution. This does not point to an inwardly driven process. Rather, despite giving credence to some mix of elan vital and teleological process, thinkers such as Teilhard are giving over a fair degree of control to chance-driven selection processes. It is only when we move away from Western influenced thinking to, say, Hindu metaphysical treatises, that we get closer to a truly inwardly driven evolutionary process (eg, Aurobindo, 1974).

It is worth pointing out that the Darwinian concept of biological evolution has been recently challenged, and that some theorists regard the whole theory as being in crisis, in that the typological view which preceded Charles Darwin, and which he argued against, is not to be so readily dismissed (Denton, 1985). The issue of typology will be taken up later, in relation to Bohm's (1980) theory of implicate and explicate orders, and how I see his notions providing explanatory power to the evolutionary concept. But, beyond any issue of criticising current evolutionary theory, I must address the issue of biological evolution because, in the view I wish to put forward in this thesis, the evolution of consciousness is inextricably bound up with that of biological evolution. Indeed, it is more appropriate to say that biological evolution is, in part, an outcome of the evolution of consciousness.

CONSCIOUSNESS

Before I deal directly with the term "consciousness" I wish to address the confusion that is liable to arise in the use of related terms such as "mind", "mental", "cognition", "awareness", "perception" and so on. For example, in some texts the terms "mind" and "consciousness" are used as synonyms. In my view, this leads to confusion, because these terms relate to two different things.

The word *mind* comes from the Anglo Saxon *gemynd*, which means *to think* or *to recall*, and is comparable with the Old High German word *gimunt*, which means memory. With thinkers such as John Locke, whose main philosophical work was published in 1690 (Locke, 1961) and Rene Descartes, who originally published his major work in 1641 (Anscombe & Geach, 1954), the word mind took on a deeper and more philosophical significance, with a meaning closer to the term soul or spirit. In fact, Descartes used *esprit* where he was referring specifically to what he regarded as the seat of reason (as residing in mental substance, where the pineal gland was the location of the causal interface between mind and body). Although Locke disputed the *a priori* nature of knowledge, and posited experience as the only given, he gave credence to a mind (an inner something) which dealt with what was acquired by the senses. We get another clue to the meaning of the word mind when we see that its earliest origin is in the Sanskrit term *manas*, which is the egoic principle or higher self in humans. From this, I assume that mind refers to something like an inmost self, as opposed to the every day waking self.

Not wishing to push the etymological issues too far, it seems clear that the term "consciousness" was derived from the Latin *con-scientia* (literally, with knowledge), where this term relates to inside knowledge (as opposed to knowledge of things external as in *scientia*). In this sense, consciousness seems to refer to a subjective entity which lies back of *scientia*. In my view, consciousness is synonymous with the word *self*. I here wish to distinguish between a *self* and a *higher self*, and so regard mind (higher self) as distinguishable from consciousness (self). I shall make this distinction clearer as I proceed.

Modern psychology has been uncomfortable with any notion of a **self**, because psychology has clung to objectivity, despite the highly subjective nature of its field of enquiry. The truth is, that consciousness has no particular objects of its own, because (at least in space-time) the objects of conscious experience are the same as those of non-conscious experience. To be conscious is to *live* the uniqueness of one's experience while transforming it into the universality of one's knowledge. Viewed in this way, we do not conflate conscientia and scientia, and clearly see that the latter is a function of the former.

I wish now to make certain key distinctions between terms such as mind, consciousness, awareness and cognition, because I shall use these terms in a special way that is different to their conventional usage in, psychology. Additionally, I need also to briefly discuss the issue of the relationship between consciousness (and its subordinate terms) and the brain.

1. Mind and consciousness: Taking into account the two quite different meanings I have given to the terms mind and consciousness (but without relying on etymological arguments), I shall argue that consciousness (as the everyday self) is a derivative of mind (the higher self), and is thus junior to it in a hierarchical sense. I will argue this not on the basis of etymology, but by using David Bohm's implicate-explicate theory as the basis for a model in which Mind is implicate, whereas consciousness is an explicate of Mind. Note that, from here on, I use Mind (with a capital M) rather than mind, so as to distinguish Mind (as a region within the implicate order) from its non-technical usage as in common discussion (eg, I have just made up my mind), from its usage as in philosophical arguments (eg those of the physicalist on the mind-body problem), and from its usage in most psychological paradigms (eg, as in cognitive science where it discusses the mind's representations of reality).

2. Consciousness and awareness: The term *awareness* is sometimes used as a synonym for consciousness. However, I feel that this, too, leads to confusion, because there is a need to distinguish between the awareness which all sentient creatures seem to have and the self-

awareness that only humans seem to possess. For example, a cat stalking a bird is very aware of the bird and the desired outcome, but does not possess the self-awareness of its owner, who remembers how she felt when she found the last dead and mangled bird lying at the back door. Psychology in particular has a difficulty in recognising that awareness is not the same as self-awareness, and that consciousness includes, but is not reducible to, experience. Thus, awareness is junior to consciousness, whereas self-awareness seems (at least in part) to characterise consciousness.

3. Consciousness and cognition: The term *cognition* is used by most psychology texts in a narrower sense than that of consciousness, and I regard it as hierarchically junior to consciousness. The Latin origin (*cognitio*) shows that its root meaning is *to become acquainted* with something, or to *learn* something, or to *acquire knowledge*. That it is used as a lesser term than consciousness is evident in the way that many (if not most) cognitive scientists use it (Gardner, 1985), where they exclude altered states and the affects, leaving cognition as embracing all those processes that are commonly regarded as employing the mind (and the mind's representations) to do the work (eg, memory and thinking). Thus, in the sense in which cognitive science employs it, cognition appears to be only **one** of the operations of consciousness.

4. Consciousness and the brain: It is difficult to consider the topic of consciousness without also considering its physical organ of expression -- the brain. It is the difficulty of considering consciousness apart from a physical organ which makes it so easy for many consciousness theorists to lean toward a physicalist-reductionist stance. Even where the view is not one of extreme materialism, consciousness is still regarded as dependent in some way or other upon the brain. The theoretical views on this issue range from seeing consciousness simply as a byproduct of the neural activity in the brain, to seeing consciousness as having an existence quite independent of the brain even though it must express itself through a brain. During the course of my thesis, I shall show that consciousness is as much an explicate of the implicate order as is the brain.

At this point a brief digression is necessary in regard to dualism in general and Descartes' version in particular. The model I shall develop in the course of this thesis depends on two quite distinct entities -- the implicate order and the explicate order. The fact that these two orders have very different property lists and are not reducible one to another shows that my model is essentially dualistic. Descartes developed a dualistic system in making such a clear and sharp distinction between mind and body (see the earlier discussion). His distinction was so sharp and rigid that there arose the problem as to how two such totally different categories of thing could ever interact. From this Cartesian problem or trap, there arose the notion that all dualistic schemes have an interaction problem. I do not believe this to be the case, and I shall show (in Chapter 3) that my dualism does not suffer from the Cartesian trap, and that not only is interaction between the implicate and explicate orders possible, but is necessary to the process of evolution.

Also, in the model I develop in Chapter 3, I shall show that consciousness is the explication of a very high region within the implicate order (that I have called Mind), where this explication is the result of a complex interaction between evolving neural structures and the implicate order. In that consciousness is as much an explicate as is the brain, there is no dualism and hence no issue in regard to the Cartesian trap. Interaction between consciousness and brain can and does occur as between so many other aspects of the explicate order (eg, between the software and hardware in a computer).

I will not be able to define consciousness with any precision. This definition will come out of the expositions in Chapters 3 and 4. However, it is worth setting out now some of the key aspects of what we call consciousness, so as to place these on some conceptual map for future use. To ease this task, I will deal at present only with human consciousness, wherein certain key issues arise.

Firstly, there is implied an organisation which is interposed between the vegetative life of an organism and the world with which it is in relation.

Secondly, consciousness appears to objectify itself and reflects itself in a model of its world. That is, consciousness is in the world because the world (especially that of others) enters into its constitution.

Thirdly, the construction of a model of the objective world appears to be the task of consciousness and its being.

Fourthly, consciousness organises itself either simultaneously (synchronistically) or historically (diachronistically) with reference to sensory data.

Finally, consciousness is organised so as to have an experience at each moment of its history, and to manifest as the person which emerges through this history.

Long ago, (in 1690) John Locke (Locke, 1961) listed many constituents of consciousness, such as perception, thinking, doubting, believing, reasoning, knowing and willing. Any comprehensive definition must include criteria for the structure and function of each constituting agency. Borrowing somewhat from Locke's original and thoughtful analysis, human consciousness appears to be strongly related to: **affective life; experiencing reality; attention-reflection; personality** and to **volition** (will). Therefore, any attempt at defining human consciousness entails considering each of these factors in turn, and then considering the meta-nature of that which organises and relates them.

Consciousness and the affective life: Far from defining consciousness, the affective state presupposes consciousness to be the very condition of experience. That is, to be conscious is to have sensations, all of which affect the body or set off reactions within it. This is another

way of saying that to be conscious is to experience sensations (internal and external) and, as a result, to feel.

Consciousness and the experience of reality: Conscious beings perceive an apparent reality, and in adapting themselves to this reality, unfold a complex operational capacity. To be conscious is to know one's experience. That is, to be conscious is to be capable of grasping one's own knowledge in the categories of verbal communication. This must be true even for those sense modes (eg, olfactory) for which we lack a sophisticated vocabulary, by comparison with, say, that of vision.

The major implication here is that the human mode of consciousness is, to a large extent, defined in terms of the speech (internal or external) capacity. However, this ignores that which we call unconscious, in that what is said (internally or externally) seems to sit on some deep structure of language that is never present to consciousness. We are aware only of segments of a given train of thought, as occur in a conversation, or as I type these words, and are never aware of the entire train. It is only when we have got that train out (verbally or otherwise) can we see it as a complete entity, and then realise that prior to this, the greater bulk of it was unconscious.

Attention-Reflection: Attention expresses the notion of a tension toward some desired goal, where the degrees of attention are hierarchical, ranging from involuntary functions to free-creative acts. Alertness, attention and wakefulness are synonyms, and are the result of a dynamic function and structure, which arrives at its optimal power of differentiation only by acquainting itself with the infrastructures from which it emerges. This is a key notion, and lies at the root of the evolution of consciousness, in that consciousness evolves to the extent that the enfolded infrastructure becomes a part of the awareness of a conscious being.

Reflection is the process by which thought returns in on itself and duplicates the acts in the external world which it directs. It is carried to its furthest power by attention. This might be

understood to mean that reflection is some higher mode of consciousness and not synonymous with ordinary waking consciousness. Perhaps this is where consciousness gets closest to pure ideation, which makes the assumption that there is a realm of pure ideas to operate in. What I am trying to convey is that consciousness is not a given state or particular experience, but is that meta-structure within which there are a variety of modes, which seem to be arranged hierarchically, with reflection being a higher state than, say, a cognitive process such as numerical reasoning.

Personality: The self is complex, and not simple, where personality is a history, linking the self's modes into a series of events, and the self is the author of its own person. If self-consciousness involves founding one's own person, and if conscious being is the very nature of the person, then neither the totality nor the basic structure of the person can be reduced to this manner of being conscious or to this idea of consciousness. Personality and self represent the transcendental aspect of *being someone* with respect to that person *having consciousness of some thing*.

Volition (Will): Philosophically, the issue of volition or will has been linked with that of the moral or ethical sense. This leads into the view that consciousness becomes moral consciousness when it evaluates-reflects upon its values, where moral consciousness cannot be radically separated from psychological consciousness. Morality is far from being some absolute entity or state, because it is caught up in that sea of reflections called consciousness.

In considering affects, experiencing, attention-reflection, personality and volition as the major factors of consciousness, it would be easy to fall into the trap of assuming that these factors in combination comprise consciousness. That is, to regard consciousness as simply the sum of a collection of parts. Conversely, it would be just as easy to assume that consciousness is some diffuse thing that permeates its various psychical structures, thus refusing to consciousness its own structural integrity. In the first view there is an indifference

to the interconnections of the parts and to any meta-aspect. The second view seems to oppose the rooting of consciousness in the body, such that consciousness is not regarded as a natural phenomenon because it is utterly transcendent. It is my view that neither of these approaches is correct, because I regard consciousness as existent in its own right, as having a hierarchical order and as being the meta structure that integrates the parts without being the sum of them, and as being expressible through a physical form.

However, note from my earlier argument that, in positing consciousness as an explicate in its own right, I am avoiding the kind of dualism that Descartes created, with its attendant difficulties. Rather, consciousness is a very high order explicate of the implicate order. Thus, in my thesis, consciousness (mind in common parlance) and brains (bodies) are both explicates, hence there is no dualism, and no problems regarding their interaction. I have already conceded that my scheme is dualistic in that there is an implicate order and an explicate order. However, as will be shown in Chapter 2 (and reinforced in Chapter 3), the explicate order derives from the implicate order, where interaction is not only feasible but essential to the evolutionary process.

THE IMPLICATE-EXPLICATE SET OF CATEGORIES

As mentioned earlier, the terms "implicate" and "explicate" arise out of the work done by Bohm (1980), who sought to explain the fundamental paradoxes which emerge out of experiments carried out at the quantum level of matter.

The problems encountered by researchers at the quantum mechanical level will be dealt with more fully in Chapter 2. However, in simplified form, the most profound of the quantum paradoxes, and the root mystery, is the wave-particle duality of light or other subatomic phenomena such as electrons. That is, under certain conditions light will behave as a wave and thus be capable of producing interference patterns. Under other conditions light will behave in a corpuscular fashion, as individual photons, and so will not produce interference

patterns. To explain this paradox and yet remain within the agreed quantum mechanical theory, David Bohm and co-workers (eg, Bohm & Bub, 1966) postulated the existence of hidden variables. The subsequent theorising which arose out of this proposal led Bohm to postulate an implicate order, which he more fully developed several years later (Bohm; 1973; 1980).

Bohm's notions will be dealt with more fully in Chapter 2. However, because Bohm's notion of an implicate order is crucial to my thesis, I need to dwell briefly on it here. In essence, the implicate order is intangible and so non-physical, and yet contains enfolded within itself all that we regard as physical matter, which is an explication of what is enfolded. In this view, matter is an explicate of an implicate order, and as such is not the solid substantial tangible stuff beloved of physicalists. All that we regard as matter, which includes brains, has its laws and being in an implicate order. I shall argue that consciousness is an explication of something that is intangible and is, in my view, the realm of Mind (a very high region within the implicate order).

Where the physicalist insists on the identity *mind = matter*, and says that what the equals sign means is that mind (consciousness in my terminology) and matter are properties of the same thing, I wholly agree. That is, mind or consciousness is an explicate, just as is matter (eg, brains). Thus they are of the same order of things, in that, as explicates, they are both derivatives of the implicate order. However, I shall show that consciousness is not reducible to matter (brains), because it is an explicate of a very high region within the implicate order (Mind), where the brain (as an explicate) derives from a lower region within the implicate order. Mind (with a capital M) is wholly implicate (is never explicated) and consciousness (as a very high order of explication of Mind) acts somewhat as the agent of the implicate realm. In this context, brains are purely explicate although of a very complex nature.

I will demonstrate that, although consciousness is an explicate entity, it is a very different an autonomous entity from that of the brain, and is not reducible to matter per se. But more than

this, I will attempt to show that there is no dualism at the level of consciousness-brains. In this view, brains (as much as stones and stars) are an explication of an intangible implicate order, which contains within itself all that we perceive as law-like and displaying order. Beyond this, I will attempt to show that evolution per se, and in particular the evolution of consciousness, is the result of the interaction that takes places between the implicate and explicate realms. Note that in arguing thus, I am not saying that the explicate realm is unreal or ghostly. It is real enough to our sensory apparatus. How could it be otherwise, when that very sensory apparatus is itself of the explicate order.

THE EVOLUTION OF CONSCIOUSNESS

We are now in a better position to understand what is meant by the combination of the two key terms of this thesis: *evolution* and *consciousness*. In a highly simplified form, the evolution of consciousness is that process wherein the implicate order unfolds its potential (as Mind) and in so doing produces at the explicate level organisms having a self-reflecting and self-willing awareness.

If we take a strictly Darwinian view, the term **evolution of consciousness** has little meaning because consciousness per se has little place in a scheme that is so blatantly physicalist-reductionist. As seen earlier, Darwin's world view is based on a chance-driven mechanism, and evolution relates to the differentiation of genetic material in populations. The Lamarkian notion of the individual influencing its own genetic code is rejected by the Darwinian view, hence individual consciousness plays no role in the evolutionary process. In fact, the Darwinian view seems to counter the original meaning of the word evolution. There is no unfolding of what was originally enfolded. There is simply a biological progression from the very simple to the very complex, wherein chance and adaptation work together, and the unit of evolution is a species.

For these reasons, while I recognise the existence of Darwin's views, I shall not be particularly constrained by them. Although I accept the usage of the term evolution as applied to biological forms, I widen its usage to embrace the topic of the evolution of consciousness. This stance is based on the declared belief that Mind (hence its derivative consciousness) is not reducible to matter or even energy, but is (in the sense that Bohm uses the term implicate), the basis or substratum of that which is perceived as matter-energy. In this view, consciousness is the condition that arises in the interaction between the implicate order and its explication in matter-energy. Consciousness varies in degree, according to its stage of evolution. In the implicate order, consciousness is a potential only. It is in the explicate order that consciousness becomes discrete and varies in the degree of its manifestation.

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CHAPTER 2: THE IMPLICATE AND EXPLICATE ORDERS

THE NATURE OF PHYSICAL REALITY

Prior to the developments which led to a quantum mechanical view of physical reality, it was easy to cling to the notion of matter as being a hard massy substance, even when subdivided down to microscopic dimensions. That is, the classical mechanical view developed by Newton and others was applied at the atomic level of matter. However, with the advent of more powerful techniques of exploring the nature of matter and energy, and the coming to an understanding of the relationships that exist between the two, physicists were forced into questioning the classical mechanical model as applied to the subatomic realm, and the result was the emergence of quantum mechanics.

In this emergent view of subatomic entities, the very nature of reality was thrown into question. In particular, several key concepts of classical physics were shaken. One concept was that of observer-free experimentation, which was shaken by experiments that showed that the outcome of these experiments was dependent on the observer. That is, the observer's consciousness became a part of the experiment. Another key concept was that subatomic entities were deterministic in that they behaved somewhat like microscopic billiard balls possessing velocity and momentum, occupying their own unique location in space-time and could only causally interact at the local level. This concept was thoroughly shaken by experiments that showed that subatomic particles obey probabilistic laws, and can interact at a distance. That is, probability and non-local causation came into the picture, thus questioning the existing mechanistic paradigm.

Depending on one's view, these disturbing findings (and the paradoxes that went with them) invited two fundamentally different explanations. In one view, which we can call the *antirealist view*, the apparently tangible macroscopic world became less substantial than it was in Newton's time, in that the existence and behaviour of its subatomic building blocks seemed to be at the whim of those observing them, and subject to probabilistic laws. In fact, the very reality of subatomic entities, as something apart from the mind of an observer, was called into

question. The other view, which we can call the *realist position*, regards these strangely behaving entities as real, but insists that the explanation calls for a totally new view of reality. In particular, we are required to view the cosmos as a singular whole, where everything is causally linked to everything else, and where consciousness plays a key role. Within these two broad views, there were (and still are) variants on a theme, and even the founding figures of quantum mechanics did not subscribe to every facet of a given view, where some theorists even changed sides at times.

At this point, I could go straight into an explication of David Bohm's theories (Bohm, 1957/1973/1878/1980/1987 and Bohm & Bub, 1966), because that is what this chapter is all about. However, to provide some justification for pinning my faith on Bohm's theories, and in fairness to the reader, it is necessary to give some background to the startling findings briefly introduced above, and then to show where David Bohm comes into the picture, and hopefully, to the rescue.

QUANTUM MECHANICS

The best starting point for an understanding of just how different the quantum view is from that of classical mechanics, is with the *wave equation* (also known as the wave function). The wave equation is a partial differential equation which probabilistically describes a given subatomic system (eg, an electron or photon). That is, we can no longer regard the building blocks of tangible reality as being mechanically deterministic like little billiard balls, because they are best described in terms of the probability of their existence and behaviour. Only at the point of observation (in some given experimental setting) do these subatomic entities take on an actual, non-probabilistic value. That is, at the point of observation, the wave equation's parameters take on actual numerical values and the equation collapses (or reduces) to some definite and actual value, where this value describes the actual state of the entity. Many experiments have confirmed that it is the act of experimental observation that causes the collapse of the wave equation (Şelleri, 1990)

For example, this is demonstrated in an experiment which Bohm describes (Bohm & Bub, 1966), wherein electrons are shot, one at a time, at a plate having two closely spaced slits (1 and 2) in it. Behind each slit is a corresponding detector (D1 and D2), both of which are connected to a needle-scale indicator which can register zero, 1 or 2. Prior to making an observation, each electron behaves as a wave front, and obeys the Schrodinger wave equation, and spreads out over both slits, such that its position is indeterminate. However, when the electron's position is observed at the detectors, it acquires a definite position and seems to behave as a particle and no longer as a wave. That is, it will be detected either at slit 1 or slit 2, but not at both simultaneously. However, it is not possible to predict at which of the two slits the electron will appear. For this to have happened, the electron has undergone a drastic change, from a wave to a discrete particle. That is, the wave function which describes the electron as it arrives at the plate collapses to one or other slit at the point of detection (observation).

This is a disturbing finding, because it implies that, in some way, the mind, or consciousness, of the observer interacts either with the wave equation or with the entity that the equation describes. Some theorists have held that the wave equation is an objective wave (like light waves), whereas others have argued that it is simply a mathematical device which describes the laws that relate the properties of a subatomic entity to its surroundings and to other such entities. Both schools of thought appear to accept that observation is a causal factor. However, if the wave equation is an objective reality, and not simply a mathematical device, what then is the nature of the entities it describes? It might well be that the wave equation is the only reality. Some have argued thus, and this is the basic position taken by the *antirealist* school. However, according to Gribbin (1984), many experiments have shown that Schrodinger's waves are not real in space-time. They are mathematical abstractions just like matrix mechanics which were introduced by Heisenberg to explain the non-commutativity of quantum variables (page 116). If the wave equation is merely a mathematical tool, then we seem to have retained the reality of the entities it describes. This is the *realist's* position.

However, as we shall see, although we might have retained the reality of subatomic entities, we are required to accept that their existence is some function of human observation.

Many experiments have since been conducted that bear out the wave equation concept and show its remarkable precision in predicting a wide range of phenomena at the atomic level. In fact, since the earliest days of quantum theory, its successes have been so numerous and so accurate that Selleri (1990) argues that there is no other scientific theory that can even remotely compare with it (page 3). He goes on to say that, because quantum mechanics not only explains the properties of single atoms but also that of aggregates of atoms, it explains the properties of what we call matter in general including electromagnetic and thermal phenomena. But he also points out that quantum mechanics has not been without its own problems and seeming paradoxes, a major one of which is the wave-particle duality problem. This paradox was briefly mentioned in Chapter 1, and an experiment using electrons was described above which demonstrates certain aspects of it. I will now explore it further, but this time in terms of light, which most regard as having a wave-like nature, unlike the electron.

Under certain experimental conditions light will behave as an electromagnetic wave and exhibit the effect known as interference wherein two or more wavefronts will interact to cause addition (amplification) at some points in space and subtraction (cancellation) in others. The result at a given detecting surface is called an interference pattern. This interference effect can be readily visualised by simultaneously dropping two stones into a pond, separated by a small distance, and noting how the ripples interact with each other as the two wavefronts spread out. The interfering, hence wave-like nature of light, is observed in the double-slit experiment, where a beam of light is shone at a shield having two closely spaced vertical slits. Behind the slits is a detecting surface, on which appears an interference pattern, thus confirming the wave-like nature of the beam approaching the slits.

Under different experimental conditions, such as those that explore the photo-electric effect originally investigated by Einstein, light seems to behave in a corpuscular manner, where the

particles are called *photons*. It should also be noted that subatomic particles such as electrons and neutrinos, although generally regarded as corpuscular in nature will display wave-like properties in an equivalent to the double slit experiment. This is brought out in the experiment described earlier, which uses electrons rather than light. The fact that entities, such as electrons, appear to have a wave-like nature, is basic to the realist-antirealist division. For the realist, the implication is that while the entity must be real, there must be a guiding or pilot wave of some kind. For the antirealist, there is only the mathematical reality of the wave.

These and other experiments led to the conclusion that light (and subatomic particles) have a dual nature -- wave or particle. In the 1920s Niels Bohr formed what became known as the Copenhagen School of quantum mechanics (Selleri, 1990) which argued that while it accepted the wave-particle duality of light, it denied the possibility that light can simultaneously exhibit both wave and particle properties in the same experiment. This became known as the *principle of complementarity*, which means that there is a rigid opposition between two terms such that one mutually excludes the other. Bohr applied this principle widely, such as in his view that a physicist could either focus on *causality* (eg, measuring energy and momentum with great precision) or on *spacetime* (eg, measuring spatial and time coordinates with great precision) but could not do both at the same time, because one measurement excluded the other.

For a long time, experiments seemed to vindicate the complementarity principle, and the statistical predictions of quantum theory remained intact. The various experiments (see Home & Gribbin, 1991, for some examples) which set out to challenge it by showing both wave and particle phenomenon in the same experiment were dismissed by the Copenhagen School, which argued that two mutually exclusive experiments were involved in each case. But recently proposed very sophisticated experiments, in which a single-photon source is hoped to be realised (Home & Gribbin, 1991) should show clear violations of the complementarity principle, where both particle and wave behaviour will be seen in the same apparatus and literally with the same photon. Success in this will lead to the questioning of the principle of

complementarity and to looking for new ways of viewing physical reality. In particular, it will vindicate the view taken by Bohm (1980) that what appear to be two different and mutually exclusive entities (waves and particles) are in fact aspects of a higher order of reality.

The wave-particle duality paradox, although a key one, is one of several paradoxes that quantum mechanics has revealed. Another key paradox is that known as de Broglie' paradox (Selleri, 1990). This paradox arises out of a thought experiment, which considers a box B which prevents the entry or exit of any kind of particle. The box contains a single electron, and is so constructed that it can be divided into two compartments, which can then be separated to give two separate boxes, B_1 and B_2 . These boxes are then separated by a large distance (eg, taking one to Gottingen and the other to Copenhagen). The first situation (one box) was described by a single wave equation, whereas the new situation (two widely separated boxes) is described by two wave equations, ψ_1 and ψ_2 , corresponding to B_1 and B_2 respectively. The probability P that one will find an electron on opening any one of the two boxes can be calculated such that $P_1 + P_2 = 1$, where P_1 is that for box B_1 and P_2 is that for box B_2 . If box B_1 in Gottingen is opened and an electron is found, this means that one can conclude that the box in Copenhagen (B_2) will be empty, meaning that P_2 at that time equals zero. That is, prior to the opening of B_1 , P_2 had a non-zero value. On opening B_1 , and observing the contents (hence collapsing the wave equation) P_2 suddenly jumps to zero. That is, the observation made in Gottingen changed the wave function of the box in Copenhagen. This same type of quantum behaviour is found in the wave-particle duality problem and in other aspects of quantum mechanical phenomena.

This thought experiment shows two things. Firstly, that there must be causal interaction at a distance, thus undermining the local causation principle, as argued by Einstein and others (for a detailed account, see the discussion on the views of Einstein, Podolsky and Rosen, in Bell, 1987; Selleri, 1990). The local causation principle is a key tenet of classical mechanics, because it insists that two or more bodies can only act on one another locally. For example, one billiard ball acts on another billiard ball by hitting it, thus transferring a certain amount of

energy. In a vacuum, and on a totally elastic surface, a moving ball could pass very close to a stationary ball, and have no significant effect on the stationary ball. This demonstrates, rather simply, the principle of local causation. This principle gets strained a little when we come to consider very large masses (eg, planetary size) which do appear to act on one another at considerable distances through the agency of gravity. However, the classical theorist argues that the local causation principle still holds in this case, because the force of gravity falls off inversely as the square of the distance between two bodies. Thus, if we increase the distance enough (eg, from, say, 500 000 kilometres to a light year), the interaction will become negligible in comparison with its original extent, and local causation is upheld. This issue is linked with that of the possibility that one entity can send information to another at speeds greater than that of light (the limiting velocity in relativistic theory), and is at the root of a test devised by Bell (1987), which involves the spin numbers of particles. A wide variety of experiments have now violated Bell's inequality test, supporting the non-local causation view and the non-separability view, and challenging the velocity of light as a limiting factor (Gribbin, 1984, page 228).

The second thing shown by the de Broglie paradox, is that the results amount to the entry of consciousness into quantum theory. This second issue is one of great controversy, where not all quantum theorist accept it. However, quantum theory forces a consideration of the consciousness of an observer, because the theory implies that the reduction of the wave equation is due to a change in the observer's knowledge about the properties of the system generated by a given experimental measurement.

To aid an understanding of the consciousness issue, the relationship between the human observer and the physical object can be regarded as in three parts: the knowledge the observer has of the object; the wave equation describing the object and the real structure and history of the object. It is usually assumed that there is a one-to-one correspondence between knowledge and wave equation, such that two different degrees of knowledge about the object correspond to two different wave equations. Also, it is usually assumed that two different

wave equations will correspond to two similar physical processes having different properties.

If quantum theory is held to be complete, then two widely accepted (and seemingly well empirically supported) hypotheses arise:

a) Two different degrees of knowledge of the object on the part of the observer correspond to two different wave equations;

b) Two different wave equations correspond to two objectively different physical objects.

A consequence of holding that a change in the observer's knowledge generates a reduction of the wave equation leads to the conclusion that, as a consequence of hypothesis (b), changes of human knowledge can modify the physical structure of the system under investigation. That is, consciousness imprints on external reality new features that it has decided to generate. In this way, knowledge of an object is based on the action of consciousness on matter.

However, things in quantum mechanics are never quite this simple. To start with, both of the above hypotheses make the implicit assumption that the objects described by a wave equation are real. The idea that only the wave equation is real does not come out, and so the basic position here is that of the realist camp. These hypotheses also make the assumption that these real objects have an existence independent of each other. This latter is key point, and the rejection of it is crucial to Bohm's theory, as I will show later. Another problem with this formulation is that it leaves out the non-local causation issue, which is linked with the issue of separate and independent existence. In short, both hypotheses still cling to classical mechanical roots. This attachment to the classical paradigm will be explored further, when I explicate David Bohm's theory.

The acceptance of the idea that consciousness can modify the wave equation makes the assumption that consciousness is superior to matter. Good (1962) explores the ideas of

Wigner, who says that it is the entering of an impression (at the point of observation) into consciousness which alters the wave equation, because it modifies the observer's appraisal of the probabilities for different impressions which he/she expects to receive in the future. Wigner further argues that it is at this point that consciousness enters quantum theory unavoidably and unalterably. More generally, it is not some mysterious interaction between the apparatus and the object which during a measurement produces a new wave equation for the system. It is the consciousness of a *self* which can separate itself from the old wave equation and, because of its observation, construct a new objectivity in attributing a new wave equation.

For the realists, these ideas have presented a problem, which can be summed up by asking how our knowledge (purely subjective) can modify (even destroy) something that is objectively real? One answer is that perhaps nothing else is real beyond our conscious activity and that, even if some other reality exists, it certainly cannot be conceived as propagating in space and time. In this answer, objective reality becomes at best irrelevant and the important features of physics are recognised to be the subjective or conscious elements. Naturally, this not an acceptable answer for a realist. But, if we insist that there is a physical reality, then the many robust findings of quantum mechanics insist that reality must be structured such that consciousness plays a role. This, as we shall see shortly, is the position taken by David Bohm, who sides with the realist camp.

FOUR KEY QUESTIONS OR THESES

At this point, it is worth considering certain key questions (or theses) which arise out of the findings and paradoxes of quantum mechanics, that relate to the *reality*, the *comprehensibility* and the *causal* nature of that with which physics deals. These seem to come down to four basic questions:

1. Do the basic entities of atomic physics (eg, electrons, neutrons, protons, photons and so on) actually exist independently of humans and of their observations?

2. Is it permissible to regard the basic entities of atomic physics as existing outside of each other, independently in different regions of space-time, and interacting only locally through forces that do not bring about a change in the essential nature of these entities?
3. Is it possible to comprehend the structure and evolution of atomic objects and processes in terms of the mental images formed in correspondence with their reality?
4. Is it permissible to formulate physical laws in such a way that at least one cause can be given for any observed effect?

It can be seen that the formulation of these questions has its roots in the classical mechanical paradigm because, if we answer yes to each, we are back with Newtonian physics. Yet, to answer yes to each would amount to a refusal to accept the many empirically robust findings of quantum mechanics. For the antirealists, the solution is simple, because they answer all four questions in the negative. This is a nihilist approach, and marks out the antirealist school as siding with those philosophers (and some mystics, Buddhist especially) who regard as an illusion what we call physical reality. For those of this persuasion, it is more comforting to assert that the only objective reality is in abstractions such as the wave equation.

The realists have a more difficult problem. Assume that we insist on there being a physical reality of some sort, and that it is made of entities (subatomic) that are also real. But also assume that we are convinced of (at least) the quantum mechanical finding that answers question 1 in the negative. That is, we cannot go along with question 1, because we now know that there is no such thing as an observer-free experimental situation where subatomic entities are involved. At this point, we should note that, in denying question 1, we are not denying the real existence of these entities. We are not too concerned about questions 3 and

4, because we and many realists before us (at least as far back as the ancient Greeks) have been assuming that the answer to these two questions is a resounding yes.

However, in saying no to question 1, we have accepted that something (probably consciousness) in the observer interacts with the entities (or their wave equations). Leaving aside, for the moment, the problem of what this something is, we have basically accepted yet another finding of quantum theory -- that of non-local causation. As realists, and ones having strong roots in the classical mechanical tradition, this causes us some heartache, because Newton, Einstein, and some other great theorists, have said that causation can only be local.

We now have to face up to question 2. Question 2 is of a different order to that of the other three questions, because it captures the classical mechanical bedrock. However, it is logically linked with question 1, because question 2 assumes that there are actual physical entities. Question 2 is asking a very fundamental question about the nature of reality as a whole. In denying to subatomic entities an existence independent of observers, and in accepting that non-local causation can and does happen, we are required to doubt the assertions in question 2. That is, we cannot logically have observer-dependent entities and non-local causation, and say yes to question 2. If we say no to question 2, we are required to come to a very different view of reality than that which classical mechanics has given us.

Thus, as realists who have subscribed to the basic assertions and finding of quantum theory, we have some difficult choices to make. In essence, something has to give in both quantum mechanical theory (namely the implication that subatomic entities are in some way unreal) and in classical mechanics (that subatomic entities have independent existence -- independent of observers and of each other). However, we are not talking about some compromise either. Rather, we are talking about a wholly different way of viewing physical reality. This is the position taken by Bohm (as a realist), and I can now move on to an explication of his theory.

DAVID BOHM ON PHYSICAL REALITY

The theoretical physicist David Bohm has long been one of the key workers in the field of subatomic physics. He has, for a number of years now (Bohm, 1957/1973/1978/1980/1987 and Bohm & Bub, 1966), sought to resolve what he sees as deep problems within the quantum mechanical paradigm, which give rise to the wave-particle duality paradox and other quantum paradoxes. Bohm, who has always sided with the *realist* school, brings the ideas he has developed into a compact form in his book *Wholeness and the Implicate Order* (Bohm, 1980), in which he deals with issues such as **fragmentation and wholeness, reality and knowledge, the hidden variables in quantum theory, and the enfolding-unfolding universe**. While I will cite Bohm's other writings at times, most of the rest of this chapter will be based on the exposition in *Wholeness and the Implicate Order*.

As indicated earlier, while Bohm appears to subscribe to the realist view, he does not answer question 1 in the affirmative. That is, he denies that subatomic particles exist independently of human observation. He can do this validly as a realist, because this denial is not the same as denying that these particles exist at all (to do this denies our own existence). He seems to accept the basic experimental findings of quantum theory which support the view that the existence of these particles depend on human observation. However, he goes much further than this.

In his book Bohm (1980) argues that the classical physics approach of analysing the world into independently existing parts does not work very well in modern physics, and that science is demanding a non-fragmentary world view. He argues this from the basis that both quantum mechanical and relativity theories imply an undivided wholeness. Here we see that Bohm challenges the mechanistic world view (what I have elsewhere called the physicalist-reductionist view), the principal feature of which is that the world is regarded as constituted of entities which are outside of each other in the sense that they exist independently in different regions of space-time, interacting only locally through forces that do not bring about a change in the essential nature of these entities. In this view, the world is regarded as a machine, and

is the view that underlies question 2 above, wherein classical mechanics gives this question a yes.

Despite the advances made in physics, and in particular the development of the quantum physical view, Bohm argues that physics is still dominated by the mechanistic view. He feels that there is an unshakable faith among many leading physicists that eventually the most basic building block will be found, some where beyond quarks and partons. But this view is in conflict with the world view as presented in both quantum and relativity theories.

He goes on to argue that the major difference between quantum and classical mechanics is that quantum mechanical laws are statistical, and so do not determine future events uniquely or precisely. Conversely, in classical mechanics, predictions can be made with great precision, as for example in calculating the direction and velocity of an elastic sphere (eg a billiard ball) when suffering a certain force or impact. But, as Bohm (1980) points out, the laws of chance do operate in a mechanistically conceived world, and so indeterminism is not the threat to the mechanistic view it might be regarded as. He argues that the real threat to the mechanistic view comes from quantum theory. In fact, classical mechanics can be viewed as simply a special case of quantum mechanics, corresponding to large quantum numbers, which amounts to setting Planck's constant to zero.

He says that we are deceived in thinking that subatomic particles are discrete entities. Firstly, subatomic particles (eg, photons or electrons) seem to be influenced by the observer in any experiment. That is, the classical observer-free concept in experimentation was overturned. Secondly, we could no longer regard these particles as discrete and totally separate entities in space-time. On the contrary, they seemed to be causally linked regardless of their location. Thus, in contrast to the mechanistic world view, Bohm holds that the world should be viewed as an undivided whole, each part of which grows within the context of the whole. That is, each element interacts with every other element and is not rigidly independent in the sense that the classical mechanical paradigm would have us believe. In an undivided

whole, elements are altered by their interacting with each other. In fact, Bohm implies that the very notion of separate elements is an illusion created by a mind which *thinks the world to pieces* (Bohm & Welwood, 1980).

Bohm then goes on to consider the basic differences between the quantum and relativistic world views. He identifies three key parameters on which to compare these two views, as *continuity, causality and locality*. In relativity theory, because it is essentially a mechanistic view, there must be unbroken continuity, strict causality and localisation of action. Bohm points out that, despite the fact that Einstein (1952) took Newton's world view up to a new turn of the spiral, by introducing relativity, Einstein remained committed to the essentially mechanistic view, even though he was dealing with phenomena such as electromagnetic radiation (light in particular) and gravitation. His theories did not so much replace those of Newton, they extended them.

By comparison with relativity theory, quantum theory (as we have seen earlier) requires discontinuity, non-causality and non-localisation of action. That is, the key features of quantum theory are: that movement is in general discontinuous in the sense that action is constituted of indivisible quanta; that entities such as electrons can show different properties (wavelike, particle-like or something in between) depending on the environmental context within which they exist and are observed; and that two entities (eg electrons) which initially combine to form, say, a molecule, then separate, show a non-local relationship which can best be described as a non-causal connection of elements that are far apart. Importantly, in quantum theory, there is no sense of loyalty or commitment to the classical mechanical paradigm. As stated above, Bohm regards quantum mechanics as presenting an even more serious challenge to the mechanistic world view than that presented by relativity theory.

When relativity and quantum theories are compared in this way, the two theories seem to be in complete opposition. This raises serious problems. If, as Bohm insists, we are to view the world (at all levels of its existence) as a whole, then the implication is that neither theory is

complete. While both theories have important things to say about reality, one (relativity) focuses at the macroscopic level, while the other (quantum) focuses at the microscopic level. It is as though they are addressing two totally different realities, which underscores Bohm's comment (see earlier) about thinking the world to pieces where, in this case, the two separate heaps of pieces do not even seem to belong together.

In belonging to the realist camp, Bohm subscribes to reality, comprehensibility and causality in physics. While conceding to its successes at the microscopic level, he has for some time regarded quantum theory as incomplete. In particular, he has argued that the seeming paradoxes (eg, the wave-particle issue and the non-local causation issue) arising from the application of quantum mechanical theory resulted from the refusal to accept the existence of hidden variables. In the dominant Copenhagen School of quantum theory, the physical state of a subatomic system is assumed to be completely specified by its wave equation. However, this equation defines only the probabilities of results that can be obtained in a statistical ensemble of similar measurements.

In the Copenhagen interpretation, all information about a subatomic system is assumed to be contained in the wave equation through the probabilities that can be deduced from it. But this equation provides no representation of the detailed movement of an individual entity (eg, electron or photon). Thus, to call the wave equation the state equation (as is done in quantum mechanics) is misleading, because the significance of this equation is in general manifested *physically* only in an ensemble of systems having wave equations of a similar form. On the other hand, because these equations actually refer in a certain way to different systems, it is also wrong to say that the wave equation belongs only to an ensemble.

Thus, it seems that there is no clear *physical* concept of the detailed state of movement of individual entities. At best then, the quantum theory can be regarded as an elaborate system of algorithms for computing the probabilities of experimental results. However, what concerns Bohm is that few physicists are content to restrict quantum theory to this role, and so fail to

provide a satisfactory resolution of the question of how the individual entity and the ensemble of entities are related. This is because they are trying to interpret the algorithms with the aid of physical concepts.

But more than this, Bohm is concerned about the distinction between prediction and understanding. While science has the aim of prediction and useful application, these in themselves cannot correctly be identified with the whole act of understanding. This distinction comes out clearly in the Copenhagen interpretation, in which the collapse of the wave equation is accepted as an ultimate fact in nature, where this acceptance entails the renunciation on any conception of the order and structure of movement of a microsystem in favour of a set of rules for the prediction of the results of specific experiments. That is, understanding is sacrificed at the behest of prediction. If electrons enter a slit system, quantum mechanics predicts the distribution with which they will leave the slit. But this is not deduced from a concept of the overall order and structure of movement of the electrons. Rather, it has the character of a mathematical algorithm.

Even more seriously, quantum mechanics has been given a linguistic form that prevents even the hypothetical assertion of the contrary to any of its basic postulates, because this would entail a change in the experimental facts on which the theory is based. This is a very serious fault, because it is a basic requirement in science that a theory be falsifiable. As long as we stay within the formal language of quantum mechanics, no experiment is ever likely to be devised that could conceivably refute the basic postulates of quantum mechanics and thus, in principle, provide a test of these postulates.

Bohm goes on to argue that these various difficulties are resolved by extending the concepts of quantum theory to include some kind of hidden variable. The possibility that there exist further dynamical variables determining the actual behaviour of each quantum system has been suggested by various theorists, but the idea has been rejected. The rejection of hidden variables was axiomatic for over thirty years due to the work done by von Neumann in

1932 (Bohm & Bub, 1966), whose theorem stated that the assumption of hidden variables is mathematically incompatible with the established results of quantum mechanics.

However, in the 1950s, Bohm began to see the chink in von Neumann's reasoning. Bohm extended Bell's argument (as stated in the collected papers of Bell, 1987) that von Neumann's proof is based on unnecessarily restrictive assumptions, and that when these are not made, the proof breaks down. The detailed mathematical arguments used by Bohm and Bub (1966) are well beyond the scope of this thesis, but in essence show that von Neumann's proof is valid only in regard to those hidden variable theories that depend on a linear law. The assumption of linear equations of the form $(aR + bS + \dots)$ is a key assumption of von Neumann. However, it turns out that the linear form is a special case of a more general law developed by Bohm & Bub (1966). In this way, von Neumann's proof is refuted and the way is made clear for the introduction of hidden variables. The theory of hidden variables developed by Bohm & Bub (1966) reproduces all of the usual probabilities of quantum mechanics as well as the feature of the collapse of the wave equation. However, the probabilities are now the result of a random distribution of hidden variables, and the *collapse* is due to a deterministic process that satisfies a law that could, in principle, be studied with regard to its order and movement.

In this paper of Bohm & Bub (1966) one sees the germ of the notions that led Bohm to later postulate the implicate-explicate order notion. The authors say (page 465):

"We may consider the possibility that the motion of the wave function depends to some extent on all levels of its environment, out to the cosmological scale. There may, for example, be a *natural* set of variables on the large-scale, say space and time, determined in some way as yet unknown by the relationship of the atomic to the cosmological level. Einstein's notion in the general theory of relativity, that the metric depends on the large-scale distribution of matter in the universe, does suggest a deep relationship between the large-scale and small-scale levels."

A NEW THEORY OF REALITY

As a realist, Bohm resolves the problems he has identified in quantum theory in general, and in the quantum measurement issue in particular, by arguing that there is a realm which lies beyond sensory reality. It is this realm which contains, among other things, the hidden variables which give understanding to quantum theory. The sensory realm is objective enough to our sensory apparatus, but derives from a realm (subjective if you wish) which remains hidden from the senses. This hidden realm is what Bohm calls the *implicate order*.

To integrate a system of physics based only on sensory reality (classical mechanics) and the findings of both relativity and quantum theories, we need a completely new theory of physics that can embrace existing physics, and yet transcend it. As discussed earlier, Bohm regards quantum and relativity theories to be in opposition. Thus, a unification of the two theories seems unlikely if not impossible. From this conclusion, Bohm argues that, to develop a qualitatively new theory, one cannot begin with either existing theory because each is seen as a limiting case of the new theory. He proposes that we start with undivided wholeness which, of course, entails dropping the mechanistic paradigm. That is, Bohm proposes a new order in physics, wherein the currently three distinct physics (relativity, classical and quantum) can be seen as subsets of a physics that can only be understood in terms of its underlying undivided wholeness. On this basis we can come to see that reality is not represented in any one of either the sense-conditioned view (human-sized realm), the macroscopic view (the relativistic realm) or the microscopic view (the quantum realm), but that each view is partial and arises out the particular focus we choose to adopt. Whether we make observations with our unaided senses, with telescopes or microscopes, we are not observing reality in its totality.

In order to conceptualise the unbroken wholeness of reality, Bohm envisages a state that he calls the *holomovement*, which is beyond description, it being ultimately ineffable and is *what*

is. The holomovement is the totality of movement of enfoldment and unfoldment and goes far beyond even quantum mechanical laws. Arising out of the holomovement is the realm he calls **implicate**. The term implicate has a Latin root which means to enfold or to fold inward. Thus, in the implicate order, everything is enfolded into everything. The implicate order is unseen, and is that realm which contains, among other things, the hidden variables that Bohm has posited. But more than this, it contains the unseen and perhaps unknowable laws that govern the quantum, classical and relativistics worlds. Arising out of the implicate order is the **explicate order**, which is that world that can be sensed either unaided or by use of instrumentation of some kind. It comprises the worlds described by quantum theory, classical mechanics and relativity theory. Thus it embraces all that can be known whether at the macroscopic, human or microscopic levels.

The explicate order contrasts strongly with the implicate order. The term **explicate** is again of Latin derivation, and means to unfold or spread out so that it can be viewed clearly. That is, the explicate order is that in which things are unfolded, each lying in its own spatio-temporal region. Bohm envisages the explicate order as containing all forms of fields (not just those we call electromagnetic), where these obey quantum mechanical laws and not those of classical mechanics. He regards the full set of laws governing the holomovement's reality as unknown. However, from this universal set may be abstracted relatively autonomous and independent sub-totalities of movement as, for example, in the case of particles and fields.

The explicate order, as perceived by a brain, is a particular case of a more implicate order, from which the explicate is derived and is a set of recurrent and relatively stable elements that are perceived to be outside of each other. This provides the seeming mechanistic universe of the sensory world, which is amenable to a mechanistic treatment. However, in the mechanistic world view, the explicate order is regarded as all that there is.

THE INK-IN-GLYCERINE METAPHOR

In order to give some idea of what the implicate order might be, and then to explain how the explicate might reside within the implicate, and thereby become explicated, Bohm (1980) uses an interesting physical metaphor. He describes a device consisting of two concentric glass cylinders, between which is a highly viscous clear fluid (eg, glycerine), where the inner cylinder is held stationary and the outer cylinder can be turned very slowly in order to prevent the diffusion of the fluid. If a drop of black ink (which is insoluble in the fluid) is placed in the fluid, and outer cylinder is turned, the drop of ink is drawn into a finer and ever finer thread until it finally becomes invisible to the naked eye. On turning the outer cylinder back again, through the same number of turns, to its starting point, the thread is seen to reform from out of its invisible state, and continues to emerge until it finally becomes a drop of ink again. This phenomenon is based on the fact that the viscous fluid holds the ink molecules intact, even though in a thread-like form, in a certain path within itself. When the outer cylinder is reversed, the fluid holding the thread-like element exactly retraces its path, carrying the ink with it. When the ink droplet is fully drawn out to the point of invisibility, we could say that the ink droplet is fully enfolded into the fluid. When the ink droplet is again fully visible and complete, we can say that it is fully unfolded. Thus, in the enfolded state, the ink is purely implicate, and when visible is explicate. That is, we have what Bohm calls the implicate (enfolded) and explicate (unfolded) orders.

At this point, it is important to note that the relationship between the enfolded ink drop and the fully unfolded version is not one-to-one. This is so because, in the enfolded (implicate) state, the ink molecules are drawn out so finely as to be almost a thread made of single ink molecules chained together. This thread might wrap itself many times around in the glycerine, depending on how many turns were used to enfold it. Conversely, the fully unfolded drop is roughly spherical in form, having a distinct boundary condition which separates it at all points of its surface from the glycerine. Thus, there is no geometrical correspondence between the ink drop and its implicate form. This is an key fact, and is the key strength of this metaphor.

Bohm then goes on to use this metaphor to explore other, more complex, conditions of the implicate and explicate orders. For example, we can place a series of droplets in a line, and enfold this series into the fluid, then explicate it in its original pattern without any loss occurring. Even more interesting is the fact that if we place a drop of ink in the glycerine, then enfold it with m turns, then place another drop and enfold that with m turns, and repeat this n times, we have enfolded n drops in a time sequence where each droplet is separated m turns from each other droplet. In this condition, it is impossible to explicate all n drops at the same time. We can only explicate one at a time, yet they are all enfolded within the fluid. The order or sequence has become implicate. This is a key concept in Bohm's theory, because it demonstrates how what we regard as order at the explicate level (sensory reality) is founded upon an implicate order, itself qualitatively different and unseeable.

Even more intriguingly, Bohm describes the condition wherein n drops are enfolded as before, but this time the placing of each subsequent droplet is slightly displaced from the preceeding one. That is, the droplets are enfolded sequentially in both space and time. If the cylinder could now be reversed rapidly (the physical analogy breaks down here, because the glycerine would lose its peculiar molecular property), we should see what looks like a droplet moving at speed across the space in the fluid. This occurs because the eye is not sensitive to concentrations of ink lower than some given minimum, so that it does not see the whole movement. Rather, such a perception relevates (makes it stand out as in relief) a certain aspect. But, this aspect has little interest in itself apart from the meaning that there is actually an autonomous object moving through the glycerine. This would merely signify that the whole order of movement is to be regarded as similar to that of the immediately perceived object. But in the sense in which Bohm is using this metaphor, it is the holomovement which comes first, and a proper description of what is happening would involve the totality of the whole movement of the glycerine, the ink molecules, the movement of the light by which the ink is seen and the movement of the eye that perceives it. From this arises an entirely new way of viewing what physics regards as a particle (eg, and electron), and yet is clearly neither a

particle nor a wave, because what we see is actually the explicate of a complex implicate order.

As explained earlier, Bohm had already begun to tackle this problem with Bub (Bohm & Bub, 1966). There he saw that what is called the *quantum measurement problem* (the indeterminacy of the wave equation prior to observation) could be solved by introducing hidden variables. That is, associated with each atomic system is a set of numbers called hidden variables. These govern the change in properties during measurement. I pointed out that, in that earlier paper, the authors gave hints of some realm which was neither quantum nor relativistic, but which was lying back of the connection between the microscopic and macroscopic realms. Since then, Bohm has taken his thinking much further and, as we have seen, posited an implicate order. He now argues (Bohm, 1980) that the hidden variables are a part of this implicate order. Thus, they do genuinely remain hidden, yet are influential on what happens at the explicate level, especially in the relationship between a wave-particle's behaviour and the mind of an observer.

Continuing with his use of the ink-in-glycerine metaphor, Bohm then explores even more complex conditions, experimenting with different coloured droplets, modified cylinders and placing obstacles in the fluid. He uses this and the preceding examples to hypothesise that the implicate order has its ground in the holomovement, which is vast and rich, and in an unending flux of enfoldment and unfoldment. Within the implicate order there lie enfolded a totality of forms having an approximate kind of recurrence, and stability. Once explicated these implicated forms appear as relatively solid and tangible. It is to the totality of these tangible forms that Bohm is referring when he uses the term *explicate order*.

At this point, I remind the reader that, just as there is no one-to-one correspondence between the ink drop and its enfolded form, there is no one-to-one correspondence between the explicated forms, and that which lies implicated. Yet, all the same, Bohm argues that there is a relationship or law that connects what lies enfolded and that which becomes explicated.

Bohm speculates that there is within the holomovement an overall law, which he calls *holonomy*, and it is this that accounts for the order we see in explicated forms. At the moment, I am merely explicating Bohm's ideas, rather than expanding on them. The relationship between the implicate and its explicates will be explored in depth in Chapter 3.

By starting with the implicate order, as basic to all physical manifestation, we can move away from regarding all that is primary, independently existent and universal as expressible only in terms of an explicate order (elements externally related). In this existant view, we may believe that the explicate has deeper and deeper layers, but we still see it as explicate and so ultimately mechanical. With the new view of both explicate and implicate orders, we can see the explicate (no matter how fine or subtle) as a derivative of the implicate order, and as being appropriate only under certain limiting conditions. The relationships constituting the fundamental law are between the enfolded structures that interweave and interpenetrate each other throughout the whole of space, rather than between the abstracted and separate forms manifesting to the senses.

THE HOLOGRAPHIC METAPHOR

We are now in a better position to understand the significance of the second key metaphor that Bohm uses in his book (Bohm, 1980). Earlier in this book Bohm uses an analogy of the optical lens as reinforcing the mechanistic world view in that it brings about an approximate correspondence between points on a target object and points on the image created by light passing from the object, through the lens, and onto some surface (a photographic film, for example). This optical effect reinforces the mechanical view of the world because it makes possible a point-by-point imaging and recording of things that are (for the unaided eye to record) too big, too small, too fast, too slow and so forth. In this way, we can see such things with the naked eye, and this leads us to believe that everything in the universe can be perceived in this way, confirming in us the belief that there is nothing that cannot be conceived of as constituting localised elements.

Bohm then introduces the hologram as a metaphor for encouraging a non-mechanistic world view. This analogy is used, because, unlike the photographic film in an ordinary optical lens system, the hologram makes a photographic record of the interference pattern of light waves, such that each part contains information about the entire object. That is, there is no point-to-point correspondence between the object and recorded image. The holographic technique was developed in 1947 by Denis Gabor, using a mercury arc light source as being sufficiently monochromatic (Leith, 1976). Present day versions of holographic techniques for producing holograms use either laser light (highly coherent) and non-coherent (white) light.

In order to understand the way Bohm is using the holographic metaphor it is necessary to digress a little and explain the physical apparatus.

A beam of coherent visible laser light is shone through a half-silvered mirror at 45° to the beam. This splits the beam into two, in that part of the beam carries on through the mirror to the target object, and the other part of the beam (called a reference beam) travels at right-angles to the object beam to a fully silvered mirror (again at 45°) which directs the reference beam to the photographic transparency. Each beam has an amplitude and phase. The term amplitude refers to the peak value of the wavecrest of a beam, and is a measure of the brightness of the light. The term phase describes the time relationship between the crest of the reference wave and the crest of the object wave, and is an angle measured in radians. For example, if the reference and object beam waveforms were completely in phase, the phase angle would be zero. Conversely, if the two beams were in phase opposition, the phase angle would be π radians (180°). The laser light reflected back from the target object arrives at the transparency at the same time. Because the two beams are coherent but out of phase (the actual phase relationship being a function the surface of the three-dimensional object), an interference pattern will be set up between the two beams. Amplitude is preserved in the photographic film as a modulation of the depth of the interference fringes, and the phase information is preserved as variations of

the position of the fringes. The basic hologram producing arrangement is shown in Fig. 2.1.

In this way, information about the topography of the object is stored in the film. However, it is not stored in the usual photographic image form, but as a pattern of interference fringes, which describe the amplitude-phase relationship between the reference and object beams for each part of the object's surface. If the target object were perfectly flat, there would be a constant phase displacement (it could, of course, be a zero phase displacement) between reference and object beams regardless of which part of the object's surface the laser light was received from. Thus, in this case, the interference pattern set up in the film would be a perfectly regular pattern, which would be the storage of a featureless object. Because the object is usually three-dimensional and has a complex surface, there will be an equally complex pattern of interference fringes set up in the film. Thus, image information is stored about the three-dimensional surface of the original target object, in the photographic transparency. When the transparency is developed, the stored information is photographically fixed within it for all time. It is this that is known as the **hologram**, which means a *total recording* (of the object). This stored information can be retrieved by shining laser light (of the same frequency as that used to store the original information) onto the transparency. The arrangement for retrieving the stored image is shown in Fig.2.2.

The light is shone through the transparency, and most of the laser light passes through as a central coherent beam. This beam is called *extraneous light*, and is not used. However, an observer located on the side of the transparency opposite that of the laser source (but not in line of sight of the laser beam), will see a three-dimensional image of the original object as though it were behind the transparency on the source side. This is called the *virtual image*. There is also formed on the observer's side of the transparency a so-called *real image* which is photographable at

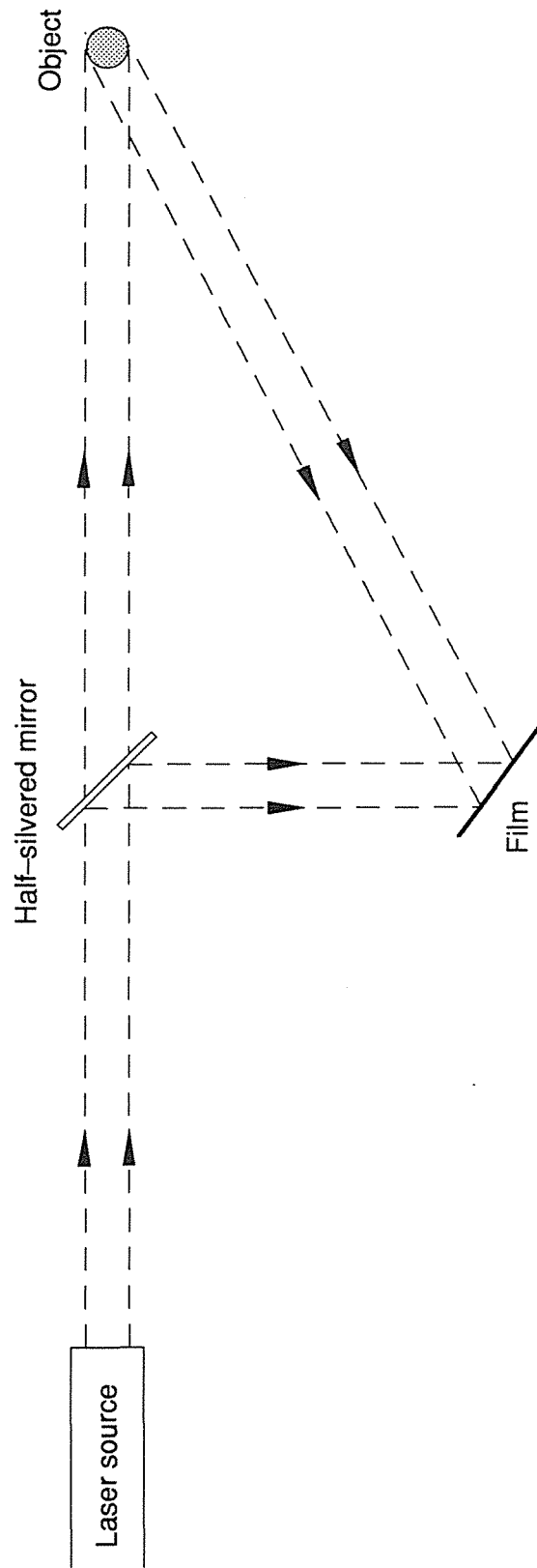


Figure 2.1 Producing a hologram

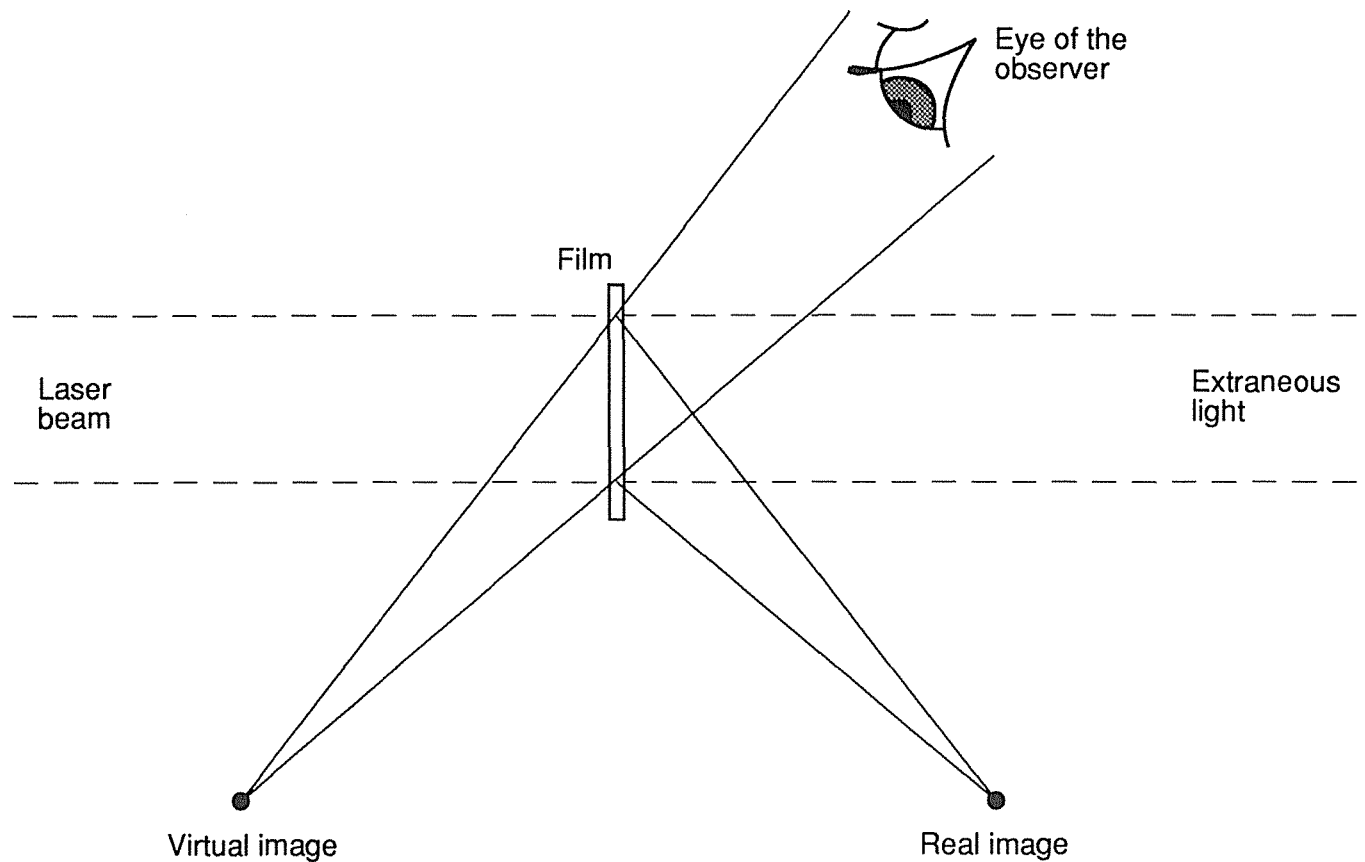


Figure 2.2 Retrieving the stored holographic image

its point of convergence some distance from the film. This image can also be seen if the observer places his/her eye at that point. However, this real image is of less direct utility than the virtual image, because its parallax relation is opposite those of the original target object. That is, it is pseudoscopic, having a reversed curvature. Both virtual and real images have a seeming three-dimensional nature because, in addition to the amplitude information (which is all that is stored in an ordinary photographic plate), there is phase information which provides exact information about the depths and heights of the various contours of the original target object.

The two key features of the hologram, which are important to my use of it as a metaphor are: Firstly, the stored information bears no resemblance to the visual appearance of the object. Secondly, every part of the film's surface contains information about the entire object. However, if only a tiny fragment is used to retrieve an image, the image will be fuzzy or vague. The greater the size of the fragment, the clearer is the image. When the entire hologram is illuminated, the object appears as in reality.

Returning to Bohm's holographic metaphor, he uses it to show that what we regard as physical reality is in fact the unfolded version of what is enfolded in the implicate order, where the implicate order is analogous to the interference patterns of the hologram. There are two parallels between the ink-in-glycerine metaphor and the holographic metaphor. Firstly, the glycerine *remembers* the ink drop and the photographic film *remembers* the light waves coming from the object. Note that I use the term remembers metaphorically, in the sense that the medium (film or glycerine) faithfully stores the information imparted in it. Secondly, in both systems there is not a one-to-one correspondence between the *remembered* object and what is stored. When the ink drop is wound into the glycerine it is analogous to combining the object and reference beams in the photographic film. Likewise, when unwinding the glycerine, to recover what was stored there, it is analogous to shining the reference beam onto the film. However, two completely different physical processes are involved.

Both metaphors are needed to understand Bohm's concepts. The ink-in-glycerine metaphor shows graphically how what we regard as a moving particle is in fact an aspect of a higher order of reality. On the other hand, the holographic metaphor lends itself better to an understanding of the holomovement, because of the dynamic interaction between the laser beams.

In fact, Bohm (1987) brings out the parallel between these two metaphors, calling the ink-in-glycerine metaphor type A and the holographic metaphor type B, where the former represents a type A implicate order and the latter a type B. The key difference between these two types of implicate order is that type A (glycerine) involves point-to-point transformations, whereas in the type B (hologram) there is no point-to-point transformation. The type A implicate order relates to explicated systems with chaotically unstable motions, where the point-to-point approach correlates with a process resembling diffusion, which can be the basis of irreversibility in physics. Conversely, the type B implicate order relates to explicated systems that involve functions such as the quantum wave function (equation), in which the basic movement is that of wave propagation and not that of point-to-point transformation.

Bohm (1987) argues that both types A and B implicate orders are limiting cases of a more general kind of implicate order, where time comes into both (as an irreversible movement in type A and as cyclical in type B). In this way, Bohm escapes from the trap of the deterministic physics which type A insists on, and argues that the implicate order has room for novelty and creativity. His notions also involve an intriguing concept that time itself is a projection of a multidimensional reality (the implicate order), which is explicated as a sequence of discrete moments. Such a projection is creative rather than mechanistic, because a given unfolding sequence of moments is not completely derivable from what came earlier. In contrast, what is mechanical is a relatively autonomous sub-totality that can be abstracted from that which is basically a creative movement of unfoldment. This clearly ties in with the contrast between type A and type B implicate orders, and is an important point, where it is vital to my notion of

evolution, because an implicate order that embraces types A and B goes beyond physics to include life and consciousness.

THE BOHM-PRIBRAM MISCONCEPTION

Some authors (eg, Anderson, 1977; Gowan, 1980) have referred misleadingly to a Bohm-Pribram model, in which the physical brain is likened to the holographic plate which has stored in it the interference patterns mentioned above, and where the eye represents consciousness, the laser beam ultimate reality, and the virtual image represents sensuous reality (Gowan, 1980, page 11). To reinforce this misconception, Anderson (1977) speculates that the direct interception by consciousness of the implicate order (the eye seeing the laser beam directly in the model) is what happens in mystical insight, where the implicate order (more likely some aspect of it) is directly apprehended.

While this usage of the various parts of the physical apparatus seems reasonable on first sight, I find some difficulty with exactly what the laser beam represents, where the model gives it as the implicate order. Yet, the beam itself does not serve as a very good analogy because the beam is merely a carrier of information and not the source of that information itself. Also, it is the beam that illuminates and unfolds what is enfolded in the interference pattern, whereas the observers' eye merely records the virtual image. Thus, while it might seem reasonable to let the photographic film play the role of the brain, the other parts of the physical apparatus seem to be assigned the wrong roles. But, shortly, I will show that even the film's role is dubious.

This so-called Bohm-Pribram model is misleading from two view points. Firstly, the model was not (as is commonly supposed) the outcome of a collaboration between Pribram (1980) and David Bohm. Secondly, these two researchers used the holographic metaphor quite independently and for very different reasons. Bohm used it as a metaphor for the relationship between implicate information (enfolded) and the explicated realm. On the other hand, Pribram (as a neuroscientist) used it to describe the way in which electro-chemically based

information is stored in the brain. Pribram used the metaphor this way because he saw the limitations of the digital computer model of brain functioning, which fails to capture the richness and immediacy of imaging, and fails to adequately handle the deep structure of speech. Additionally, while the so-called Bohm-Pribram model is illuminating, it has certain limitations. As Bohm himself points out (Bohm, 1980), the hologram is a static record, whereas the brain as a hologram is far from static in that it contains neural structures and electro-chemical processes interacting in a very complex and dynamic way.

THE RELATIONSHIP BETWEEN IMPLICATE AND EXPLICATE

In order to get the various parts of the holographic apparatus playing their correct roles, it is necessary to go back to Bohm's basic thesis, which is that there is an implicate order out of which the explicate order derives or emerges. Moreover, there is not a simple one-to-one relationship between the forms of the explicate order and that within the implicate which gives rise to the explicated forms. From this it is clear that only the interference patterns stored in the film can play the role of the implicate order. Because the only aspect of the physical apparatus which derives directly from this stored information is the virtual image, it is this which must play the role of any derivative of the implicate order. We do not need any other aspects of the physical apparatus. No metaphor has to have a full correspondence with that which it acts as a metaphor. Afterall, if the correspondence was perfect, the metaphor would be the real thing.

Therefore, we do not need the rest of the apparatus, because we cannot assign useful or valid roles to the beam and the film. We need only the stored interference patterns and the virtual image. Because, in my thesis, I insist that consciousness is a high order explicate of the implicate order, then in my use of the holographic metaphor, I assign (as before) the stored patterns to the implicate order, and assign the virtual image to consciousness. Figure 2.3 shows these various relationships.

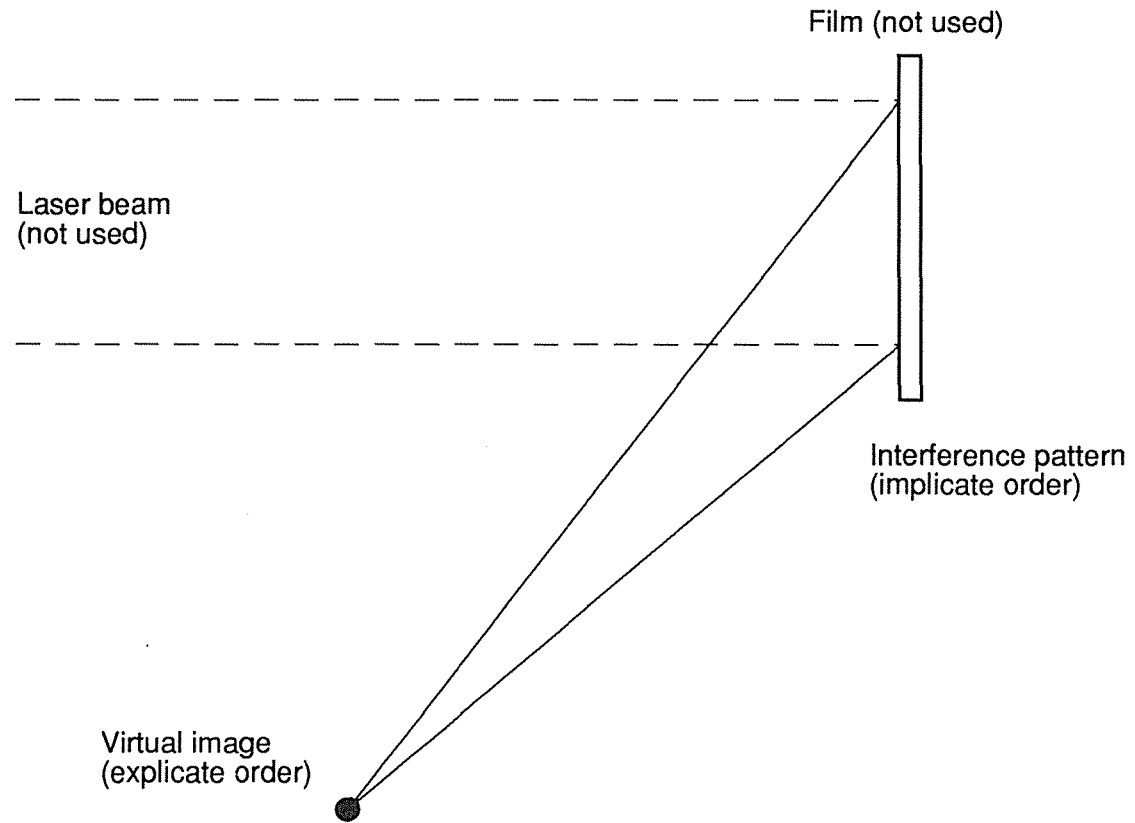


Figure 2.3 The hologram as a metaphor of the relationship between consciousness and the implicate order

One can see that, at its most general level, this figure simply shows the relationship between the implicate (stored pattern) and explicate (virtual image). Because the virtual image is a metaphor for the explicate order, it is possible to use it as a metaphor for the brain, which is an explicated form. Used in this way, it would show that there is a relationship between brains and the implicate order. However, this kind of usage could easily lead to the confusions discussed in regard to the Bohm-Pribram misconception. The important relationship, and the one crucial to my thesis, is that between the implicate order and consciousness as a very high explicate of that order. However, in Chapters 3 and 4 I will have to deal with the relationship that must exist between consciousness and the brain (where both are explicates of the implicate order), and will have to revisit the holographic metaphor (and ink-in-glycerine metaphor) to do this.

THE MIND, CONSCIOUSNESS, BRAIN RELATIONSHIP

In considering the issue of consciousness, Bohm notes that Descartes invented the distinction between mind and matter, showing that mind has very different qualities from that of matter. That is, Descartes distinguished sharply between extended substance (matter) and thinking substance (mind). The implication being that thinking substance has its existence in a non spatio-temporal realm, which raised for Descartes the problem as to how these two realms could ever relate. For Bohm, the problem is resolved by considering the realm of matter as being the explicate order of the implicate order, wherein the implicate order seems to be Descartes' non spatio-temporal realm. That is, the implicate order is the primary and immediate reality of what we mistakenly call consciousness, and of what we mistakenly conceive of as being separate in a Cartesian sense. Thus, in my usage of the holographic metaphor there is no Cartesian dualism, because the brain as an explicate order derives from the implicate and is not truly the separate state of existence that Descartes envisaged. While it is true that, from the view point of the explicate realm (spatio-temporal), mind has totally different properties from that of physical matter, this is only because matter is a projection of a higher order reality whose laws are not those of matter.

In accepting Bohm's ideas, I have to regard the mind-matter distinction as false, in that what we separately regard as mind and matter, are ultimately one. That is, the explicate and manifest order of consciousness (as a derivative of Mind) is not ultimately distinct from matter itself. In this way, consciousness and matter are different aspect of the one overall order. The more comprehensive, deeper and more inward actuality (the implicate order) is neither consciousness nor matter but is rather a higher-dimensional actuality, which is the common ground in which consciousness and matter are ultimately one. Thus, the problem raised by Descartes of how two totally different kinds of substance causally relate to each other does not arise. They do not causally affect each other. Rather, it is that the movements of both consciousness and matter at the explicate level are both the outcome of related projections from a common higher-dimensional ground.

It is my thesis that Mind is wholly implicate. Consciousness, as a high-order explicate, acts as an agent of Mind, that acts between the wholly implicate and the wholly explicate. Where consciousness is its most abstract, it has implicate aspects and where it is most concrete it has explicate aspects. The highest source of information is that of Mind. At the other end of the scale, the information stored in the brain as electro-chemical states is a wholly explicate source. Some of this neural information arises through interaction between the sensory apparatus and the external explicate world, whereas other aspects of it arise internally through the functioning of cognition. Consciousness is that which links these two extreme sources. That is, because consciousness partakes of both the explicate and implicate realms or orders it enables them to communicate with each other.

Bohm stresses that his dimensional view of consciousness and its relation to the explicate order must take into account other humans and, in fact, all of Life's forms, with their varying degrees of consciousness. But he further warns that we must not fall back into thinking that each of these entities (human or otherwise) are totally individual in the sense that they have some absolute independence from each other. Rather, all these different entities are projections of a single higher totality. But more than this, his view must take into account a yet

greater background of unknown depth of inwardness that may be analogous to the sea of energy that fills sensibly perceived space. Here Bohm refers to an earlier discussion in his book (Bohm, 1980) -- beyond the scope of this chapter -- on the notion of zero-point energy and that of space being an energy plenum rather than empty. In the same way that the vast sea of energy in space is present to human perception as emptiness or nothingness, so the vast unconscious background of explicit consciousness is present in a similar way.

From the foregoing explication of Bohm's theory perhaps I can persuade the reader that the theory offers a route out of the impasse that the mechanistic world view has created, especially as it tries to deal with consciousness. In the physicalist world view, there is no ultimate place for consciousness, even though some of that persuasion talk as though consciousness exists in its own right. But, if the universe consists purely of matter (no matter how refined) then I would be the first to admit that, at best, consciousness is an ephemeral and illusory aspect of the interaction of matter in certain structures (eg, human brains), and at worst has no existence what so ever. However, the physicalist stand seems to rest on the assumption that matter is essentially substantial, massy and consist of discrete indepenent elements, even where we give credence to fields and wave-packets. Yet, as Bohm so ably demonstrates, the mechanistic world view, with its machine-like massy structures, is found wanting when seen in the light of quantum theory. Bohm's notion of an implicate order makes possible a realm in which consciousness is the key to what is enfolded becoming unfolded, and vice versa. The theory overcomes the dualism that Descartes entangled us in, because what we perceive as matter (as distinct from mind) is merely the explicate of an implicate order.

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CHAPTER 3: THE IMPLICATE, EXPLICATE, CONSCIOUSNESS AND EVOLUTION

In the preceding three chapters, I have argued that consciousness and its evolution cannot be adequately explained in purely physicalist terms, because of the physicalist's rejection of any order other than that of the purely physical realm. It is not so much that the physicalist refuses to recognise the implicate-explicate distinction. Rather, physicalists appear to have no awareness of the distinction and so can only express themselves in terms of physical constructs. Logically, this prevents physicalists from discussing anything other than physical-type things, and so, I have argued, dramatically restricts the explanatory power of their paradigm. As an alternative, I suggest a paradigm that encompasses the existence of an implicate order, and which has, so I have argued, greater explanatory power than that offered by the physicalist tradition, both functionalist and eliminativist.

The main aim of this chapter is to explain the fundamental relationship between the implicate order and its explicates. To do this, I have to explore possible mechanisms which enable what lies within the implicate order to be unfolded. Because the unfolding of the implicate order leads to what we regard as the manifested universe, a general treatment of this process of unfolding (explication) will necessarily touch on a variety of disciplines ranging from atomic physics, through chemistry and biology to evolutionary theory.

Because the work I am doing here is highly speculative, the reader should bear in mind that where I touch on a given discipline, it is in the spirit of suggesting that there are other possible ways of explaining the phenomena dealt with by that discipline. I am not putting forward views with the dogmatic insistence that these views are the correct ones, and should therefore be substituted for the existing views. I say this now to allay any possible misconception. Namely, any perception that I am preaching some new gospel, wherein everything is explicable only in terms of the implicate-explicate order. Rather, I offer my views as interesting possibilities, and leave it for the reader to decide whether my explanations have merit, or might even have greater explanatory power than some of the currently favoured views.

However, having made this apology, it applies only to the more general topics that arise in this chapter. In Chapter 4, where I consider the evolution of consciousness, I make no such apology, because it is in this regard that I feel the implicate-explicate model has valid application. That is, I argue that consciousness does evolve, and that the implicate-explicate distinction gives the basis for an explanation of consciousness and its evolution.

THE CONCEPT OF EVOLUTION

Arising out of the notion of evolution as being the unfolding of something that is enfolded, I envisage the process of evolution at the most general level as being the making explicate of what lies implicate. That is, that which lies enfolded within the invisible and intangible implicate order is unfolded into stable spatio-temporal entities having a seeming independent existence. This existence is all that we regard as the sensory world, and includes that which requires instrumentation such as microscopes and telescopes to aid in its sensing.

Staying at this most general level of the unfolding of the implicate order, I speculate that the very first explication was that of space-time, in keeping with Bohm's notion of both space and time being explicates of the implicate order. This assumes that there would have been an original condition in which all was implicate, and there was no explicated order. That is, the cosmos as we know it now did not exist, but resided wholly as a potential within the implicate order. How or why space-time emerged is most likely beyond science to answer. But, that it should be the first explication of the implicate order makes a great deal of sense, because space-time seems to be that universal backdrop against or within which all else appears. Once space-time existed, it became possible for further explication to occur.

Recall from Chapter 2, that the overarching Law of the implicate order is what Bohm calls *holonomy*. Bohm uses this term to indicate the holistic nature of the operations within the implicate order, wherein everything is enfolded within everything else. Bohm (1980) says that this Law governs the implicate order. It is not a law in the usual sense of that word. That is, we cannot say that it defines a measurable relationship which can be mathematically

modeled. Such laws are aspects of the explicate order. It might be more correct to talk of **principles**, when referring to the implicate order, in that a principle is categorically higher than a law, where a law could be said to derive from a principle. Thus, within the implicate order, we would have principles, and within the explicate order we would have laws. However, while bearing this distinction in mind, I will stay with the term Law when referring to the implicate order, because Bohm talks of laws there, and I will cause confusion by changing terminology now.

As with everything else to do with the implicate order, a Law such as that of Holonomy is not easy to comprehend. We are used to thinking of laws in terms of a one-to-one relationship between some cause and its effect, such as in the case of the *Law of Gravity*. But such a Law is of the explicate order wherein all entities are separate in space-time. This does not apply within the implicate order. However, this is not to say that the implicate order is lawless. Far from it, because whatever laws we perceive as holding in the explicate realm derive from the implicate order. Rather, it is that the law or laws operating in the implicate order are qualitatively different (of a higher order if you wish) than those in the explicate order. It is this which enables Bohm (1984) to say that the so-called laws of chance, as seen to be operating within the explicate realm, are a lower manifestation of order within the implicate realm.

This qualitative difference between the laws of the implicate order and those of the explicate realm could give one a licence to invent implicate laws in an ad hoc fashion, simply to explain away what would otherwise remain inexplicable. I will refrain from doing this. However, I must speculate about the nature of the implicate order, and posit certain laws that operate within it. But, I will remain essentially within the notions that Bohm developed. While Bohm's notions are radical and probably controversial, they have the backing of his own researches, his status as Professor of Theoretical Physics and the status of the prestigious journals he has been published in. Thus, as long as my extensions of his theory remain logical and plausible, what I offer here stems out of a sound scientific basis.

I will now introduce what I regard as two subsets of the overall ***Law of Holonomy***. These are: the ***Law of Unfolding*** (LU), and the ***Law of Approximation to an Ideal*** (LA). Shortly, I will describe the LU. I will consider the LA in the next section, where I look at feedback from the explicate to the implicate. However, for completeness, the LA governs the relationship between explicated forms and some ideal held within the implicate order, such that these forms successively approach their ideal over many generations. While discussing laws, I will later introduce a law that operates purely within the explicate order, which I call the ***Law of Increasing Complexity*** (LC), which governs the increasing complexity of biological forms. I will discuss this law under the section on *death as a feedback mechanism*. The actions of this law are closely bound up with those of the LA, as we shall see.

In regard to the LU, I introduce a concept that is implied in Bohm's writing but not actually stated. This is the idea that the natural tendency of the implicate order is to unfold. In other words, there appears to be a ***Law of Unfolding*** operating within the implicate order. In this, I am saying that the *raison d'être* of the implicate order is to unfold or explicate what lies enfolded within it. If it were not constrained in any way, I envisage that all that could possibly ***be*** would unfold in a timeless explosion of explication. However, this clearly did not happen. Our fairly extensive knowledge of stellar and biological evolution tells us that this did not happen, and more than this, this process of unfolding is still going on.

I am suggesting that something constrained or prevented the possibility of this timeless explosion into explication of all that lay enfolded within the implicate order. I offer the view that the very first constraint was the explication of space-time. By explicating this primordial pair, the implicate order placed a self-imposed limitation on the manner of any further explication. It is my argument that, having caused the properties of extension and duration to come into being, under the action of its own law, there was no alternative but for the implicate order to conduct all further explications in a space-time fashion. I argue that once space-time existed, and had generated its own constraints upon the further explication of material forms, for some long while, the process of explication went on in a fairly automatic fashion. The implication

here is that the control over what was unfolded resided purely within the implicate order, such that the explicated forms had no influence in this process. However, a little later on, I will show that this mode had to change.

A CLOCKWORK ANALOGY

I do not propose to delve into the various disciplines that deal with aspects of the origins of the universe. I acknowledge that there are controversies in this respect, but do not wish to get caught up in them. But, it seems to me, that if one goes back far enough toward some universal origin, the complexity of atomic structures that exist today did not exist then. That is, there appears to have been what might be called an evolutionary trend at the atomic level. To explain this, I suggest that, having explicated space-time, the implicate order then unfolded the atomic elements in a sequence of increasing complexity. As the subatomic entities that quantum mechanics deal with are regarded as the building blocks of the atomic elements, hence everything else, it seems reasonable to assume that the process of unfolding ever more complex atomic forms was, in some way, related to the unfolding of subatomic quanta. This is clearly not a testable hypothesis. What I am saying is that it seems evident that there was a point of origin of what we know as matter, and that what we have today did not arrive all in one go. I, therefore, suggest that there was an unfolding process that led from then to now. I will expand on this view later on in this chapter.

One can understand this initial automatic process of unfolding by using a clockwork analogy, linked with the ink-in-glycerine metaphor. Imagine that the outer cylinder of the apparatus is connected to a coiled spring, such that when an ink drop is fully enfolded within the glycerine, the spring is under maximum tension. That is, unless constrained in some way, the outer cylinder would unwind under the spring's force. If the rate of unwinding is controlled by an escapement mechanism as used in a clockwork watch, then the spring cannot unwind with a rush, but must gradually release its energy in turning the outer cylinder slowly. In staying with a simple escapement mechanism, the rate of unwinding (hence unfolding) is constant and is not a function of what is being explicated. That is, what has been explicated at

any one point, plays no role in determining what will be unfolded or how fast the unfolding will go at any later point.

I argue that such a mode of unfolding went on for a vast length of time and over vast regions of space. I also argue that this mode was not dependent on the nature of what was already unfolded (rather automatically) from the implicate order. However, this near-automatic mode did not and could not last, because the complexity of the explicated forms steadily increased until a point was reached where the explicate order began to have an influence on further explication.

Again, in the spirit of proposing possibilities, I speculate that once the emergence of the subatomic realm had reached a certain stage, the emergence of atomic forms would have been facilitated. Beyond these, molecular forms would have emerged. With the appearance of molecular forms (simple compounds at first, followed by more and more complex chemical compounds), there arose the possibility of the even more complex explicate forms that we call living or biological. That is, those explicated forms dealt with in biological evolution. It is clear that these forms have emerged in a certain time sequence, wherein the earliest of these forms were very simple and the most recent are very complex. The most widely accepted explanation of this sequence is that given in Darwinian theory. However, as this theory is based upon physicalist premises, its explanation of this progressive sequence of living forms is very limited such that it can only posit a chance-driven mechanism, and a process of natural selection.

In my proposals here, chance plays only a minor role in the process of progressive unfolding, because I suggest that all the life forms that have appeared to date (including those we may never know of) existed in potential within the implicate order long before explication ever began. But to explain how this explicate sequence unfolded in time, I am introducing the notion that each successive unfolding influenced that which followed. That is, what is unfolded beyond the purely automatic phase is a function of what has already been unfolded. Here, I

am suggesting that living forms unfolded systematically and progressively, because the process of explication entails a complex relationship between what has already been unfolded at any given moment, and what lies yet to be unfolded. This means I need now to consider how the explicate order can influence the implicate order.

The usual biological evolutionary focus on the operations of evolution at the purely explicate level obscures the relationship between the explicate and implicate orders. This is because, as stated above, the theory of biological evolution is physicalist at root, and so cannot take account of an implicate-explicate distinction. If it is true, as I am arguing, that evolution amounts to the unfolding of what lies enfolded, then there must be some causal relationship between the explicate and implicate orders. That is, the spatio-temporal unfolding of increasingly complex, more mobile and more conscious forms must be governed by some law-like relationship.

Earlier, where I discussed the earliest phase of the implicate's unfolding process, I suggested that the simplest conception of such a law (the Law of Unfolding) would be that the control over what is explicated resides purely within the implicate order. In this case, the explicate order would have no influence on what is unfolding. That is, the appearance of forms in space and time would be the result of actions arising wholly within the implicate order. As suggested earlier, I believe that this was the mode of unfolding employed to bring into explication all that we regard as non-living matter. However, this purely automatic mode of unfolding would not be adequate to account for the unfolding of biological organisms.

FEEDBACK FROM EXPLICATE TO IMPLICATE

At this point, it is necessary to consider the concept of a given explicate form being able to causally affect the implicate from which it arises. In that an explicate form appears to be an effect (rather than a cause) of the implicate order, it does not make immediate sense to speak of the explicate order causally affecting the implicate order. This is because the notion of cause and effect assumes a one-to-one and one way relationship between a cause and its

effect. For example, in the relationship between a racquet and a tennis ball, at least in a properly conducted game of tennis, the racquet is the immediate cause of the ball's motion (the effect). In this case, the causal relationship is one-to-one and is essentially in one direction only (allowing, of course, for Newton's First Law, in which the ball does become a minor cause of the racquet's behaviour). But, in the case of the implicate-explicate relationship, there cannot be a one-to-one causation, as demonstrated in David Bohm's ink-in-glycerine model. That is, the explicate does not appear to causally alter what is lying implicated in a direct, and one-to-one way. However, this is not to say that there is no causal relationship. In fact, I will show that the explicate order does have a causal influence on the implicate order.

I propose that, beyond the purely automatic phase of unfolding, as needed for the explication of inorganic forms, there appear increasingly more complex degrees of feedback from the explicate order to the implicate order. In the first of these, there is only the need for the presence of certain explicated forms to cause the implicate to explicate more forms. This would apply to the simplest of biological organisms. In the next mode of feedback, not only is the presence of organisms required, but some aspect of the explicated organisms that influences what is further unfolded. Up to this point, note that the organisms themselves do not directly influence the implicate order. At a later stage still, with the appearance of animals having some degree of consciousness, the mode of feedback becomes more direct. To explain these various modes by which the explicate order influences the implicate order, I will now introduce a series of analogies, each one more complex and subtle than its predecessor.

As already discussed, it is the natural and ongoing tendency of the implicate order to unfold what lies implicated within it, under the Law of Unfolding. The simple clockwork escapement analogy used earlier permits a certain very slow rate of unfolding to occur, until an ink drop appears in the glycerine. Used as an analogy, the linear escapement helps one to see how the more purely automatic mode of explication of pre-living forms occurred. However, to

understand how complex living forms come to influence what is further unfolded, the linear escapement mechanism is no longer suitable, and a new mode must come into play.

It is here that the Law of Approximation to an Ideal (LA) comes into its own. Recall that the LA governs the relationship between explicated forms and some ideal of that form held within the implicate order, such that these forms successively approach their ideal over many generations. Note, at this point, that I am not saying that the LA makes decisions regarding the fitness or otherwise of an organism to its environment. I will expand on this issue in the next section, where I will consider the way in which organisms and their environments interact to produce ever increasing complexity and suitability of form. This aspect of fitness is a purely explicate process and happens between parts of the explicate order, and is well explained by such mechanisms as natural selection and adaptation. What I am saying, is that the LA works (via the interaction between explicated forms and the implicate order) toward an increasing match between explicated forms and some ideal residing within the implicate order. Note that in this, we have two different senses of the notion of suitability of forms. The first concerns that suitability which arises out of the operation of natural selection. This is a purely explicate process. The second relates to how the explicate form matches to an ideal residing within the implicate order, and involves an explicate-implicate interaction. However, as we proceed, it will become clear that there is a complex interaction between these two modes of suitability. I aim to show in this chapter that these two modes of suitability, and the mechanisms that lie back of them, are inextricably linked.

A NEW CLOCKWORK ANALOGY AND THE NOTION OF SHAPE

I now return to the question of how complex living forms influence further unfolding. This can be understood by staying with the clockwork analogy, but by modifying the escapement mechanism such as to make its operation a function of the explication process. To do this, the state of what has already been explicated must be detected in some way.

To keep the case simple, consider a situation in which a series of n ink drops have been enfolded, each by m turns. What we require is that, with the appearance of each successive ink drop, the rate of unfolding increases by some fixed increment. That is, the rate of unfolding becomes a simple function of n . The simplest mode of detection would be to sense the level of greyness of a given slowly unfolding trace that is to become the ink drop. When the greyness level reaches some predetermined level (that of black!) an ink drop will have been sensed, and the escapement rate can be increased. This could be achieved simply by using a photo diode and light source to detect the greyness level. The signal produced by this circuit could be used to operate an electrical relay, which in turn alters the escapement rate.

Thus, the rate of unwinding becomes some function of what has already been unwound. This is a very simple example, but shows the general principle. More complex devices might be fitted to the outer cylinder in order to regulate the rate of unwinding, which could be either accelerated or retarded, according to some feature of the glycerine or ink. Thus, in the case of the implicate-explicate relationship, rather than the explicate directly causing the implicate to unfold, the explicate detects changes in its own state, which in turn permits more of the implicate to be unfolded. This distinction between direct and indirect causality is not one of opposing modes, but one of difference in degree of influence.

In moving from the analogy to the actuality, we have two problems. First, the problem of explaining how changes in the explicated forms are firstly detected. Secondly, the problem of how such detected changes can be used to influence the rate or fashion of unfolding of the implicate order. To understand these problems, we have first to consider what sort of changes need to be detected. Basically, it is those changes that would have arisen from the organism responding to its interaction with its environment. Recall that this is a purely explicate process, and involves natural selection.

The relationship between an organism and its environment is basically two-way. That is, the environment has an effect on the organism, and vice versa. However, the earliest living forms

would have had very little impact on their environment, but would certainly have been at the mercy of the environment and suffered all sorts of abuses at its hands. For these environmental impacts to have had a lasting influence, they would have to have been recorded in some way in the organism. What we are talking about here is some sort of biological "memory". Here, I am using the term memory in the way that we might say that a piece of bent fencing wire "remembers" any given *shape* it is put into.

I propose staying with this useful notion or metaphor of shape, as something that captures or remembers the history or experiences of an organism, and use it with a meaning somewhat like that of the Greek *morphe*, a word which Plato later broadened to mean the *eidos* (form) of a thing. But, the idea as I am using it is not particularly Platonic. I stress that time enters as a factor, because the shape does not remain fixed for all time. It changes as some function of time. I will return to this point again, when I consider death as the means by which this shape influences the implicate order.

Applying the term shape (as a metaphor, and not in its literal meaning) to organisms subjected to environmental forces (ie, those of natural selection), it is obvious that a very wide variety of *shapes* would emerge across a large number of similar organisms, even when subjected to the same general setting. Some shapes will be conducive to survival, and result from a superior response to the press of the environment. Other shapes will have arisen from counter productive responses, which will be liable to lead to extinction if they came to dominate. Yet other shapes will be entirely neutral in their effect. What emerges here is a notion of the *appropriateness* of an organism's shape.

This entails three factors. There is the LU, which ensures that organisms come into being in the first place. There is also the LA, which slowly adjusts shapes across evolutionary time, according to some ideal residing in the implicate order. Finally, there is the LC which operates purely within the explicate order, and pushes forms toward increasing complexity.

What we need to introduce is some filtering process by which only those shapes which are life-affirming are permitted to influence the process of unfolding the implicate. It is at this point that the LA comes into play, because the ideal for any given shape lies within the implicate order, and it is against this ideal that any given shape must be compared.

Going back to the ink drop metaphor, instead of as before merely detecting the greyness level, we might have an ink drop shape-detecting device (as found in robotic visual sensors), along with some microprocessor circuitry which has been programmed to analyse shapes against preset criteria of fitness. Note here, that I am using the term shape in its usual sense of physical configuration, and not metaphorically. We might have a protocol that says that those shapes that do not meet these criteria will not be taken into account in the ink drop counting procedure, and so will not influence the rate of unfolding. This is clearly a simplistic analogy, because it cannot influence anything but the unfolding rate, which (in itself) does not ensure better quality ink drops. What we need is a system that will unfold better and better shapes, and prevent earlier or lesser quality shapes unfolding.

To do this, the glycerine would have to contain a very large variety of shapes ranging from those that were so ill-formed that they would completely fail the shape criteria, to those that were exemplars of the ultimate shape to be aimed at. However, it is clear that if all of these potential shapes were within the one mass of glycerine, it would be difficult to access them systematically. For example, because access would be random, the first accessed shape might be close to perfection. This is not what I want in the analogy, because I am saying that there is a movement within the unfolding process that is along the dimension of ever increasing matching of forms to some ideal within the implicate order.

In the ink-in-glycerine apparatus, imagine that the outer cylinder is divided into many disk-like compartments, stacked vertically. The lowest of these compartments would contain a range of randomly enfolded shapes, the average shape of which only vaguely met the criteria. The next compartment up would contain shapes of a slightly improved form, and so on up the

stack, until we get to the top compartment which contains the exemplars. Each compartment can be turned independently of the others, where each has its own coiled spring and shape sensing circuitry. The microprocessor circuitry can now be arranged to *look* at the lowest compartment first, as it unwinds. On sensing the first shape to approximate the ideal (no matter how vaguely), the microprocessor stops the unfolding operation of the lowest compartment, and begins that of the next compartment up. This first detected shape within the first disk is clearly unlikely to be the best shape within that disk. But it is good enough to allow the process to continue. The same process is repeated with the next compartment up the stack.

In this way, the unfolding process would move steadily (but not linearly time-wise) up the stack and finally reach the top. Note that, the process is not temporally linear because, within any given compartment, the order of enfoldment of shapes (in that range) is random. Thus, it is not possible to predict just when a suitable shape will be found which allows the next up compartment to be accessed. One could further complicate this analogy, by having the microprocessor modify its shape criteria, starting with very loose criteria initially and ending with very tight criteria. This modification would be the result of detecting better and better shapes. That is, the overall protocol would be one of ever closer and closer approximations to the ideal.

DEATH AS A FEEDBACK MECHANISM

The analogy just described is beginning to approach what is needed to explain how the form taken by an organism can influence what next unfolds. However, it does not cope with how or at what point the shape stored within an organism is detected and used to influence the unfolding process. To explain this, I need to consider the process that we call death. To do this with full philosophical rigour is beyond the scope of my thesis. However, as death is a key factor at this point, I must deal with it to such an extent that the reader can follow my argument.

From the purely physicalist viewpoint, death is a final ending, because when the body corporeal dies and decays, with it goes that life form, there being no possibility of any kind of survival beyond death. I am arguing, however, that because the sensory realm (the explicate order) is derived from another realm (the implicate order), we must treat death in a way quite different from that of the physicalist. The three usual philosophical ways of dealing with the issue of survival beyond death are:

(a) To invoke the notion (essentially Hindu) that what we see as the physical body is no more than the gross form (a sheath) of a superphysical body (for example, the so-called astral body). In this view, death is a release mechanism, freeing the superphysical entity for an existence in the superphysical realms. In this way, survival beyond death is dealt with without necessarily having to invoke the notion of a soul or self which transcends death. But note that in the Hindu scheme, there is an entity called Atman, which is the true self, and which uses the physical and superphysical sheaths for the purposes of incarnation in the lower (non-Atman) worlds.

(b) To accept the corporeality of a person, hence the fact that death means an ending of that person, but to invoke some superhuman power that can bring the dead back to life again, as in the Roman Catholic view point. However, here we are dealing with replication rather than survival, because in this view the notion of the soul as a surviving substance is missing.

(c) To argue that the essential person is an incorporeal substance that is capable of an existence separate from the corporeal body, such that it survives what we call death. This notion is basically Platonic-Cartesian, and introduces the concept of a transcendent self or soul.

The line that I take is essentially that of (c), although the model I am developing could embrace certain aspects of (a) as well. I argue that the death of any organism (from

protoplasm to human and beyond) is more than a space-time phenomenon. If we try to understand death purely in terms of space-time, we will fail. All we will see is a form that once displayed what we call life, ceasing to do so and then undergoing decay. If we view death in terms of the implicate-explicate distinction, we can see death more in terms of a change of state rather than a final ending of something. This is because the form we knew as the living corporeal being was the explication of that which remains for ever implicate. We never see the true form (what I am calling **shape**), only its explication. But note that, in arguing thus, I am not entering into controversies surrounding souls and the superphysical realms they might inhabit once they are free of their mortal coils.

Although the form dies to our space-time bound sensory apparatus, the essence or quality that *informed* (perhaps the better word would *enformed*, as linked with *enfolded*, but I am not aware of such a word) that form does not so die, because this essence is of the implicate order and so is outside of space-time (recalling that this pair is an explicate). While it is true that, as far as the explicate form is concerned, there is no reversibility, only an ending and decay, this is not true of what I call the shape. I argue that, at the point we call death, the shape acquired by a given lifeform during its explicated existence returns to the implicate (is re-enfolded), and has influence there. At this stage in my argument, I will be talking only about relatively simple life forms which would not be regarded as possessing a personality or personal identity. This makes the task of dealing with the mechanism of death somewhat simpler. Later, when I introduce the factor of consciousness, I will obviously have to expand further on the death mechanism. Thus, in the next chapter, where I deal with the evolution of consciousness, I will take into account the difficult issue of personality and its relationship to shape, and hence the manner in which personality might survive beyond death.

To picture how a **shape** might be re-enfolded into the implicate order, imagine that a fully unfolded ink drop is stirred such as to alter its shape, then enfolded again. Although there is no one-to-one correspondence between the unfolded and enfolded entities, what is re-enfolded will be different from that originally enfolded, which means that we have influenced

the total state of what is enfolded. The stirring, or shape altering, is analogous to what happens to an organism during its lifetime. The point of re-enfolding is analogous to what we would call that organism's death. The re-enfolding is analogous to the re-absorbtion of the essence of that lifeform back into the implicate order. It is accepted that this overall analogy has certain limitations, the main one of which is that in the analogy the entire ink drop is re-enfolded rather than its shape. In this physical case, it is difficult to conceive of the shape aside from the drop, where the shape becomes something like the smile of the Cheshire Cat in Alice. However, the ink drop analogy serves to give an idea of how, at death, the *shape* finds its way back into the implicate order and influences what is already there.

Rather than regard the new-born organism as shapeless (the Empiricist's notion of the *tabula rasa*), I suggest that an organism arises from the implicate order with a certain shape. Recall that I am using the term shape along the lines that Plato used that of *morphe* (the essence of a thing). We could say that the shape is a *memory trace* residing in that which is explicated. That is, a memory of that which is within the implicate order. In this way, I can use shape and memory trace interchangeably.

It is the shape or memory trace that is modified during the organism's lifetime. Note that I am not implying a Lamarckian process in this explanation, because I am not saying that environmental changes directly influence or cause changes in genetic material. What I am suggesting though is that the impact of the environment on the organism, and that organism's responses to those impacts, alter the new-born shape in the organism. It is these, at death, which influence what is already in the implicate order, and so produce a change within the implicate order. In this way, over many generations, these changes within the implicate order emerge as new explicate forms (at the genetic level), and show up in the explicate order as a change in the genetic material of a given species.

At this point, some explanation is needed as to what lies in the implicate order that can be modified by the reabsorbtion of a given organism's shape. The implicate order contains the

essence of what is, and lies back of all that we perceive as space-time reality (the explicate order). When an organism is explicated, it carries with it its new-born shape, which is a "memory" of that which lies implicated. But the process of explication does not create a hole or vacuum as it were within the implicate order, that can only be filled when the explicated organism dies and its shape is reabsorbed. The implicate order is characterised by infinity, and cannot be so depleted. However, when a given shape is reabsorbed, it takes on the nature of the implicate order and interacts with that which lies there, and acts to release new possibilities. In the explicate realm, these new possibilities must appear as new genetic material, because this is only in this way that new organisms can come into being. Thus, the key effect of new unfoldings is the creation of new genetic material hence an enhancement of the existing gene pool.

Thus, although from the viewpoint of the explicate realm, I talk of the reabsorbed shape modifying what lies implicated, this is for convenience and the lack of a more appropriate word. From the viewpoint of the implicate order the term modifying or changing is not strictly correct. But neither would the term replaces be correct. Because there is no one-to-one correspondence between the explicate and implicate orders we cannot conceptually have a point-to-point mapping of what I have called shape in the explicate realm, and that which is the essence of that shape in the implicate order. All we can say is that what returns interacts with what is already there, and that this results in new genetic material being explicated.

It is here that the ink-in-glycerine analogy gets stretched, and we must remember that it is only an analogy. Clearly, when an ink drop is unfolded into full view, it is no longer enfolded in the glycerine. There is nothing lingering in the glycerine that we could call the essence of the ink drop. However, the real power of the ink-in-glycerine metaphor lies in its ability to show the relationship between the implicate order and its explications, and we should not expect more than it can give.

A SIMPLE COMPUTER ANALOGY

To explain the relationship between returning shapes and what lies within the implicate order, it might be time to leave the ink-in-glycerine model behind.

Imagine a computer which is being used to develop a certain piece of software. The programmer doing the development works at the keyboard and screen, using a high level programming language (that is, uses words and mnemonics that are almost plain language). The programmer does not access the internal workings of the computer at the screen, although that is what he/she is doing indirectly. There is no direct access to the machine's instruction set nor to the hardware registers, all of which operates at the level of machine language or code (essentially binary 1s and 0s). When some change is made (analogous to a shape changing) and this is entered into the machine, the software changes, and this appears on the screen. This appearance on the screen is analogous to new genetic material being explicated. But note that no change has been made to the instruction set (this is hardwired in most machines), nor has the programmer ever directly interacted with the machine language (he/she does not need to and may not even know of its existence, because a compiler exists between him/her and this level of computer operations). In this analogy, the instruction set and machine language equates with what lies hidden within the implicate order, whereas the programmer, the high level language, the keyboard and screen are in the explicate order. The interface between the two is the compiler that converts the programming language into machine code, and vice versa.

Returning to the evolutionary process as we know it at the biological level, we need to further explore the relationship between the implicate and explicate orders, and an organism's shape. To do this fully would probably occupy the rest of this chapter, but we can consider it in enough detail at this point to tease out the basic ideas. To do this, we have to isolate (artificially of course) four factors: the implicate order (*I*), the explicate order (*E*), the *shape* (*S*) of the new-born organism (recall the discussion about shape, and what I mean by this technical term) and the local environment (*LE*) of the organism (this of course being a part of the explicate order). The movement of unfolding is always from *I* to *E*, where this movement

is determined by the influence S has on I . In this discussion, we have moved beyond the phase where I was unfolding in automatic as it were (the first subset law), because E has an influence on I (the LA). This influence comes about through the mechanism of the organism's death, whereby S' (no longer simply S), as the end-product of the organism's experiences, is absorbed (re-enfolded) back into I . But S' itself is formed by a complex interaction between the organism and LE .

Recall that I have already introduced the law of Increasing Complexity (LC), and said that this is a law purely of the explicate order, because it involves interaction between biological forms at the explicate level. That is, there is no law within the implicate order that directly governs the evolutionary trend toward complexity and increasing organisation. However, as stated earlier, the LC is inextricably bound up with the explicated effects of the LA. This must be the case, because all that is explicated has its origin in the implicate order, and comes to be unfolded as a result of *shapes* finding their way back into the implicate order, interacting with the ideal there and causing the release of new shapes. To explain the subtlety of the relationship between the LA and the mechanisms within the explicate order, entails analysing the relationship between shapes and their environments, as I will now do.

In the simplest of organisms, S' would arise mainly as a result of LE impacting on the original S and, over the organism's life time, changing it into S' . That is, the organism would be the purely passive recipient of LE . At this stage, organisms would have little impact on LE . As organisms became more complex and acquired greater mobility, they would be able to actively influence LE and even change it. Initially, this changing might be no more than fleeing from a hostile environment to one more conducive to life. This is changing LE by replacement, rather than changing LE itself. But this latter mode would come in once organisms acquired the power to do so. Nor can we consider a single organism in isolation. We have to bring in an ecological viewpoint. If we take this far enough, we have S , LE (this is E in the guise of a local ecosystem) and E (other organisms and other aspects of the environment) all involved in a complex interchange, as part of an entire ecosystem. Thus, the final shape that finds its

way back into the implicate order is the outcome of complex forces, and not the simple result of the local environment impacting on the original shape.

With this further complexity, we need to consider the relationship between individual organisms and the species to which these belong. Consider the appearance of the very first species. The form taken by the members of this species would reflect the extremely limited degree to which living forms could be explicated at such a primordial stage of evolution. The amount of change caused by, and suffered by, any given organism within such a species most likely varied considerably across the entire membership of the species. However, this would have averaged out across the species such that, at the species level, an evolutionary trend could be seen.

From the viewpoint of the traditional Darwinian theory of evolution, evolution is the change of gene frequency at the species level, wherein the overall gene pool is steadily enriched. The ideas I propose here can accomodate this notion. However, if what I offer here has plausibility, then it would make redundant the chance-driven basis of the synthetic theory. This is so because I am proposing that there is a systematic relationship between S , LE (as part of E) and I , hence between what unfolds from I into E . That is, the reabsorption of S' back into I leads to the unfolding of further genetic material, as a part of E . In other words, in the scheme I suggest here, (as described above) the outcome of a re-enfolded shape influencing the implicate order would be the explication of new genetic material, because (at the purely explicate level) it is the genes that determine the initial features (S) of any organism. I am not denying chance a role in any of this. Clearly, chance exists, and certainly comes into play at the purely explicate level. But I am offering the view, for consideration, that chance need not play the dominant role in the overall unfolding process of evolution, as argued within Darwinism. In this context, it is interesting to note (as pointed out before) that Bohm (1984), regards chance as a lower manifestation of order at a higher dimension.

At this point, a brief digression is necessary. In connection with this issue of species, there arises the distinction between the notion of evolution according to the synthetic theory, and that of typology (the pre-Darwinian notion). Using the *I*, *E*, *S* and *LE* analysis just given, and assuming the nature of the implicate order is as I propose, then the relationship that exists between the implicate order and the explicate order (as described above), points away from the Darwinian notion of a chance-driven evolution, toward something closer to the earlier typology theory. That is, the taxonomy of types that the synthetic theory admits to as existing, would have its origin in the implicate order. If my notions have validity, then what the evolutionist sees as the tree of life would not have come about by some chance process. It is the explicated form of an implicate law.

To lend some possible validity to the idea that, not only is the process of unfolding systematic, but that types emerge as a process of explication from the implicate order rather than come about by chance processes, I cite Denton (1985). He argues that there is mounting evidence against the synthetic theory of evolution and growing evidential support for a typological theory. According to Denton, the main cause of the reluctance on the part of biologists to acknowledge that Darwinism is a theory in crisis, is due to the fact that an admission of a typological concept carries with it some brand of creationism (Denton, 1985). I am not qualified to challenge or accept Denton's claims, nor am I saying that Darwinism is in crisis. What I would like to offer is another view or explanation as to how the clearly distinguishable types we see in biological evolution came about, other than by mechanisms of pure chance. Certainly, the view I offer can embrace the notion of typology without having to invoke a creator that stands outside of its creation.

Thus, in the view I put forward, we could regard the order of types that we see in the phylogenetic sequence as the spatio-temporal unfolding of a law that pre-exists within the implicate order. This would require that, across the vastness of geological time, there exists a complex relationship between the sequential unfolding of individual explicated biological forms, the species they belonged to, the setting in which they were optimally suited and that

which lies implicated and is the essence of what appears as typological order. The issue of typology versus Darwinism is very complex and lies well outside the scope of this particular thesis. It is raised here merely to underscore the view I present in which chance plays only a minor role in the overall evolutionary process, regardless of whether one is considering biological evolution alone, or the evolution of consciousness. I reiterate the point I made at the outset of this Chapter. I am not rejecting current theories whether of physics, biology or evolution, nor am I saying that they are in crisis. However, I would like to offer an alternative. That is, I am merely exploring some of the possibilities and alternative explanations.

A SUMMARY TO THIS POINT

To recapitulate at this point, I have so far isolated three distinct modes by which the implicate order unfolds. These were described with suitable analogies as:

Purely automatic: In this mode, the implicate order followed its own natural tendency (the Law of Unfolding), and explicated forms without regard to the nature and quantity of those forms. This phase covered the period from the initial explication of space-time, through that in which quanta, atomic and chemical structures unfolded. For this I gave as an analogy, a simple clockwork escapement mechanism.

Explicate influences implicate: In this mode the presence of what has already been explicated influences the implicate order. This phase covered the appearance of the simplest of biological forms, where the feedback to the implicate order concerned quantity and complexity, and did not involve the activity of the forms themselves. That is, the process of feedback from explicate to implicate would, for long aeons, have been a relatively unconscious process. By this I mean that it unfolded in a somewhat mechanistic way, because these very simple forms themselves had no direct causal link with the implicate order. For this phase I introduced into the clockwork analogy a means whereby the presence of ink drops were detected and used to cause further unfoldings.

Death as feedback: This mode covers the period from the earliest appearance of living animals, having some degree of mobility, and an increasing influence on their environment. The feedback to the implicate order occurred at their deaths. As evolution proceeded, the complexity of the explicated forms increased. This in turn conferred greater degrees of freedom on these forms and hence greater impact by the form on its environment. Thus a new factor entered the process, and modified the nature of the memory traces. A series of qualitative changes would have occurred in this process. That is, the degree of influence of a given species on that to be next explicated would have come to outweigh the influence of the environment. In this way, the division of labour between what was due entirely to the press of the environment, and that due to biological influence, would have changed such that the environmental influence waned in favour of biological influence. For this phase, I further modified the clockwork analogy, introducing a means whereby the actual shape of the ink drop was detected and compared with some criterion within a microprocessor-based system.

THE ENTRY OF CONSCIOUSNESS

Eventually, the complexity of this series of evolving forms would have reached the point where some primordial degree of sentience (awareness of the environment) transformed into the form of awareness that most would agree as warranting the use of the term consciousness. At this point, I remind the reader that, in my thesis, Mind comes first, and so this primordial consciousness (as explicate) is an outcome of the interaction between Mind (as implicate) and its explicates. It is not some incidental by-product of (solely explicate) organic complexity.

I concede that in the processes of unfolding I have sketched in the preceding sections, the central nervous system (CNS) of this evolving series of organisms would have increased in complexity. This is governed at the explicate level by the law of increasing complexity over the span of evolutionary time. I also concede that biology and neuroscience have explanations for the fact of the increasing complexity of CNSs. However, these explanations are physicalist at root, and so ignore the existence of the implicate order, and say nothing

about the consciousness that utilises these biological forms. As indicated earlier, the explicate LC of biological forms is bound up with the LA. This relationship becomes very subtle once consciousness enters as a factor, as we shall see.

In my thesis, consciousness is itself an explicate (one of a very high order) and plays a role in the further explication of biological forms. That is, I am arguing that the increasing complexity of central nervous systems throughout the course of evolution is some function not only of biological evolution but also of the influence consciousness has within the implicate order.

It can now be seen that what had been a more or less purely biological process up to this point, takes on a new dimension in which the conscious awareness (although primordial at this stage) of each evolving organism (as a member of some given species) plays an active role in furthering the evolutionary process. In Chapter 1, I attempted to define consciousness, and from this analysis emerged the idea that consciousness was more than simply the sum of a collection of cognitive and affective processes. Rather, consciousness appears to have a superordinate or meta quality. This is because consciousness, no matter at what level it manifests at, is an independent explicate of the implicate order. That is, independent of those forms that were earlier explicated (what we call matter).

As we saw in Chapter 1, at one level, consciousness is characterised by awareness. At another level, consciousness can be characterised by purposiveness. An organism may be aware of its surroundings in the sense that it receives sense impressions, and yet lack purposiveness. However, it is difficult to picture purposiveness without awareness (whether outgoing or inward looking). In this context, I use the term purposiveness to imply a cognitive state of knowing what one is doing and why, even though there may be degrees of this knowing. I intend to show how purposiveness evolves out of basic awareness. But, at this point, I want to focus on how the factor of purposiveness comes to influence the process of biological evolution. This comes about because a degree of purposiveness has entered the

link between the organism and its environment, which modifies or, under certain circumstances, even replaces the mechanistic process of natural selection.

This factor of an organism's purposiveness is not brought out in most accounts of biological evolution, especially in those having a rather strong Darwinian orientation. Even where Darwinism is dealing with species such as the primate, which have a very high degree of conscious awareness, and purposiveness, it is the processes of natural selection and random gene mutation that is held to dominate in the evolution of these species. In my thesis, however, conscious awareness plays an increasing role in the evolutionary process, because consciousness itself becomes an active agent between the implicate and explicate orders. In saying this, I am referring to more than cultural evolution. That human consciousness has played a part in the evolution of cultures and societal structures is commonplace. But I am suggesting much more than this, and that consciousness itself, prior to the appearance of humankind, has played a role in the unfolding of biological forms.

At this earliest stage of evolution where consciousness comes to play a role, the degree of consciousness is fairly minimal, and its function as an active agent has barely begun. The mode of information exchange between changes taking place in explicate forms and the further unfolding of that lying in the implicate order is still mostly automatic.

To delimit this important evolutionary zone, I can use examples which act as anchor points at either end of a scale. In my view, I can safely anchor the lowest end of this scale at the appearance of the amphibians (eg, frog like animals), and anchor the upper level of this zone by the reptiles. Thus, I am saying that within this zone, what I call purposiveness began to emerge, and marked the point at which consciousness entered as an active factor. However, at this point of appearance, the degree of purposiveness is very primitive. For example, most people would not view the frog as very purposive, yet it interacts with its environment, and can certainly change its environment for one that better suits its needs. It can move freely between a watery and land environment, and has skillfully adapted to both settings, without

losing an elementary degree of adaptability. In setting this zone, I have excluded at the lower end Pisces (fishes) which, in my opinion, do not display what I term purposiveness. Thus, I definitely exclude insectivora which predate Pisces, and thus avoid disputes such as those about the purposiveness displayed by the digger (nest building) wasp, or about the purposiveness in the dance of the bee. However, I am aware that some would argue that I am unfairly excluding the insects. But, because I am linking consciousness with increasing freedom from behaviours that are the outcome of hardwired neuronal responses (instinctual), where greater consciousness is synonymous with a movement to flexibility and learning, I feel that I am justified in this exclusion. At the upper end, I have excluded Aves (birds), because in my view this species clearly displays a primordial purposiveness (as in nest building and in territoriality). Thus, I argue that somewhere within the zone marked off by the amphibians and reptiles, there appeared something that we could regard as the embryonic beginnings of purposiveness.

Returning to the original discussion, consciousness comes to influence the process, because it confers a primordial purposiveness upon a given organism, enabling it to consciously alter its environment in order to better suit its own needs. At first, (as argued earlier) these alterations in the environment of a given organism may be little more than the fleeing from an unsafe or hostile environment to one which is more conducive to life. At this stage of evolution, the organism (or species) is not so much altering the environment as replacing one environment with another. Direct alteration comes much later.

Because we have now moved into a qualitatively different mode of evolution compared with that so far described, the analogies used so far will not suffice, because they have been too mechanistic (they were that way to suit the earlier mode of unfolding). What we need now is an analogy that can cope with the factor of purposiveness or conscious choice. The previous notion of *shape* still holds, as does the manner in which this shape gets back into the implicate order. What has changed is the manner in which the new-born shape comes to be altered -- by the organism consciously acting upon its environment rather than being the

passive recipient of environmental impacts. For example, returning to the delimited zone discussed above, the frog is beginning to act on its environment, at least to the extent of exchanging a hostile one for one that is more life affirming. Conversely, a simple worm is very much at the mercy of its environment.

COMPUTER-BASED ANALOGIES

However, now to return to the factor of purposiveness. To better understand the way in which this factor of purposiveness begins to operate in the feedback process between explicate and implicate orders, I have to move away from the more mechanical clockwork analogies used above. I will use instead a series of computer-based analogies. These are better suited to exploring how the degree of local autonomy and consciousness increases in a given organism, and how that consciousness interacts with the implicate order.

Note, however, that I am not using the computer as analogous to the way in which the brain operates, or as an analogy for cognitive processes. Rather, I am using some of the modes of interaction possible between computer and human user, because this explores a complex human-machine interface, which analogises the interface between explicated organisms and the implicate order. No analogy is perfect. If this were so, the analogy would no longer be an analogy, it would be the thing it stands for. Bearing this in mind, I ask that the reader accept where the analogy gets a little stretched, and try to see what the analogy is pointing to, rather than focus on its imperfections.

In a very simple electronic data communications network (sometimes called a message system), the intelligence resides wholly in the host processor (the network processor), where the terminals (or nodes) of the network are dumb, in that they do no processing of their own and act merely as input-output devices. This is little more than a computer-based telephone exchange system, where instead of telephones we have a keyboard and visual display unit (VDU), coupled by a modem (this adapts the parallel digital data of the computer to a form suited for transmission down a telephone line) to other keyboard-VDU terminals all via some

central processor of some kind. The main difference between such a simple data communications system and a telephone system is that messages are stored in the former, whereas as the latter (generally) operates only in a real-time mode.

In the simplest case, such as in an Electronic mail (E-mail) system, the nodes communicate with each other according to some protocol residing within the network processor. The human user is able to transfer data file envelopes electronically to another user, lodging messages in that other user's mail-box. In a largish system, there will be a number of file-servers, which are computers in their own right, all under the control of the network processor. The system can be used only to send and receive mail. A user cannot modify any of the computer software, nor is there a true data base to be accessed. Another version is called a bulletin board, where users can (electronically) leave notices on the board, or look at the board to see what messages might be left there. The bulletin board concept can be used as the basis for running conferences by computer, where delegates participate by uploading their contributions and downloading those of other participants.

In a more sophisticated data communications system, the E-mail aspect may be combined with access to a data base. For example, this could be a student data base, on which is stored student details such as academic records and personal details. Thus, using such a system in a university, academics and administrative staff can communicate electronically, and also access the data base. In most such systems, there has to be the ability to change the data (eg, a student completes a course of study, or withdraws from a course). In the interests of student confidentiality there will be some degree of control over who can access the data. In the interests of system integrity and security there will be an even higher degree of control over who can change data. For example, some clerical staff (eg, those in the Registry) may be able to change student data, whereas most academics would only have access to the data.

In a still more sophisticated network, the terminals have a degree of local intelligence, and so can make certain local decisions. This alleviates the host machine of the need to make low-level decisions, thus freeing it up to focus on higher level decisions and to leave software capacity for coping with a large ever-changing data base. For example, certain data processing algorithms might reside in the local terminal. In a very sophisticated network, a fairly high degree of local intelligence may reside in the terminals, and they will play a fully active role in the exchange of information between the network users and the host machine. For example, in the student information system mentioned, certain fixed data (eg, enrolment rules or majoring options rules) could be held at the local terminal, which means that only the local terminal need be interrogated, leaving the main processor free to get on with more difficult tasks.

Now let us compare these simple data communications systems to the relationship between the implicate and exlicate orders. In doing this, it will be seen that there is overlap between some of the mechanical analogies and these new computer analogies. This overlap is deliberate, because it facilitates understanding. However, to enable the reader to see where analogies correspond, I will tabulate the analogies and their relationship with the I-E mechanisms, at the end of this section (see figure 3.1 later).

In the purely E-mail system, there is no local intelligence and only the ability for the users to communicate with the system or with each other. The user has no influence on how the system operates, and certainly has no control over the system's software. This analogises the stage of unfolding at which the organism, simply by its existence, influences the implicate order (eg, at the level of the flora). In the E-mail plus data base system, there is some degree of local autonomy in that data can be accessed for use. For some users there is even greater autonomy whereby the user can change data. This analogises the mode where organisms are acquiring some degree of mobility (at least enough to flee a hostile environment, as in the frog example) and so are acquiring some influence over their ultimate shape, hence the ability to influence the implicate order. The introduction of local intelligence at the user's terminals,

analogises the possibility that an organism is acquiring some degree of control over its environment, and is no longer a passive recipient of environmental impacts. That is, the shape that the organism finally renders up to the implicate order has something of its own making in it. This might be at the level of Aves, such as in the territorial behaviour of the magpie. However, much of such behaviour is probably instinctual, so a better example might be that of the class of bird that learns to remove the tops from milk bottles.

However, although there has been some increase in autonomy of the terminal users of the data base system, note that in the above analogies only data can be changed, and not the controlling software. That is, all we have is a system which links users for the purposes of communications or record keeping. We could have a system that had the E-mail and data base facilities, but also enabled certain authorised people (perhaps technicians or systems analysts) to access the very software that controlled the system. This might be for reasons of upgrading the system, or clearing faults. Such a user would have very special access, because not only can he/she use the E-mail, and access and change data base information, but also modify the systems programs that decide such things as E-mail address lists, passwords, users' degrees of status, terminal priorities and so on. This type of access entails a fairly high degree of local autonomy, and is analogous to an organism which is definitely able to modify its environment in ways other than swapping environments. For example, birds can build quite complex nests, and beavers control water level in a sophisticated way by building a system of dams. At this stage, we have an animal that is only one removed from being able to have a direct influence on the implicate order via consciousness. This influence comes in at the truly primate level, and will be explored more fully in Chapter 4.

Staying with computer based communications systems, to introduce further sophistication, we would need some degree of artificial intelligence (AI). Initially, this capability might reside only at the file servers or network computer. But in a very sophisticated system, there would be a degree of AI at the terminals themselves. This entails more than simply saying that the terminals have some degree of local intelligence as I did earlier. In that usage, local

intelligence simply means some degree of local processing power. Artificial intelligence is another order altogether.

AI systems are designed to appear to behave intelligently, in that they replicate some of the processes and behaviours that are normally ascribed only to humans, where these are definitely not present in conventional digital computers and networks. This is because, regardless of the amount of processing power possessed by a conventionally programmed computer, the software is deterministic and highly rule-bound. It is designed to solve problems for which there are known algorithms (solution steps). For example, such software can solve certain complex mathematical problems, and do millions of these in, say, an hour. But it can do this only because the solution is well known and can be broken down into discrete steps. The speed, though impressive, is no measure of intelligence. Such software could not be used to solve mathematical problems for which there is no known solution.

The two main components of AI systems are a *knowledge base*, and an *inference engine*. The former contains the data the system needs to work with, and the latter is what does the work on this data. For example, in a medical diagnostic context, the knowledge base might contain a large amount of medical facts, and the inference engine would contain rules regarding how to relate given symptoms to a given medical problem. Such systems can deal with information that conventional computer systems cannot deal with, such as incomplete data and sets that are not wholly determined, but are fuzzy. These systems can also learn, and use heuristic techniques. That is, they can attack a problem for which there is no known algorithm (set of steps that lead to a solution).

As just explained, this is quite unlike the deterministic logic used in non-AI software, where the only problems that can be solved are those for which a complete algorithm can be generated. The combination of hardware and software used to realise AI machines varies. It may be that the cleverness resides only in very sophisticated software, that utilises a fairly conventional digital computer (ie, that using von Neuman architecture). Conversely, it may be

that the hardware departs radically from the conventional digital machine's architecture, such as in systems employing parallel distributed processing where many tiny digital computers operate in parallel. It may be a mix of hardware and software techniques.

AI systems find many uses, particularly in *expert systems*, which aim to emulate some human expert, such as a surgeon or stock broker. In this use, they aid a human user to solve problems and make decisions that would otherwise require the services of a living human expert. A particular expert-type system use of AI that can serve as an analogy for the mode of unfolding which entails a increasing degree of local autonomy (eg, at the primate level) would be that used in computer-assisted instruction (CAI).

For a long time now, traditional CAI has been carried out using conventional deterministic computing techniques. In these systems, there are built-in solutions for the problems that are put to the learner. Most of these systems had very little (if any) power of reasoning, and so had a limited problem-solving ability. In contrast, AI CAI systems start from the premise that the teaching programs should themselves be expert in some given field. That is, to be able to solve the problems set for the learner, and to be able to follow and to evaluate the ways in which the learner approaches the problem. They will also contain a theoretical basis for the teaching strategies they use, where these are explicitly stated and not buried in the knowledge base.

In the simplest of AI CAI systems, using a network approach such as in the distributed classroom notion, there would be a number of terminals, each available to a student. The system would be able to teach some given topic, say mathematics, and be able to cope with users whose abilities fell within a certain narrow range. The system would set problems, and students would (independently of each other) respond at their terminals. The system would have only a limited capability to follow the students' methods, point out where errors were occurring, analyse performance and give remedial tasks. The learning would be in the nature of set questions, for which there would be set answers. There would be no opportunity to

interact with the system, as is possible with a human teacher. Used as an analogy, this CAI system has no real parallel with the mechanical analogies I gave earlier. It lies beyond the ink drop shape-controlled analogy, and roughly equates with the stage of interaction between I and E that occurs where organisms were acquiring increasing local autonomy, but were not directly changing their environment, and certainly not having any direct influence on the implicate order.

A more sophisticated CAI system would be able to cope with students having a fairly wide range of, say, mathematical ability (within some given course, say linear algebra). Students would be able to interact with the system and each other (as though in a class room) via their terminals. The system would be able to track each individual student's solutions to given problems, and vary the mode of teaching to suit learning styles and general ability. It would be able to compare across the student users, and check for such things as systematic errors that are caused either by the students' own methods or by a given erroneous teaching method. For example, if the system noticed that all students were making the same error on a given problem despite there being a wide range of abilities, it would be able to make inferences that might lead to the conclusion that this aspect was not being adequately taught, and make suitable changes. Also, the system would be able to give the appearance of having slowed right down for those students who were struggling, and at the same time appear to be taking shortcuts and even breaking all the rules for those very bright students. A wide range of remedial tasks would be available, and these could be set to suit each given student's needs and abilities. As an analogy, this system fits that stage of I-E interaction and evolutionary processes where consciousness has come into its own, and a high degree of local autonomy existed, such that organisms were interacting with and changing their environments, and ecologically interacting with each other. At this stage, there would be a wide range of shapes within a given species, where each shape had its own unique impact on the implicate order once reabsorbed.

Finally, we can envisage an AI CAI system that could teach a wide range of subjects (eg, mathematics, chemistry, biology, etc...) from 100 level through to graduate level. Such a system would have all of the features mentioned above but, in addition, it would permit the very bright student (and those working at the graduate level) to interact with the system's software in such a way as to (a) influence each other student's responses, and (b) produce changes in that software. For example, a conference mode could be set up for graduate students, who were jointly working on a project, where both the knowledge base and the teaching strategies could be challenged and a consensus reached as to what was all right and what needed changing. The course controller (human) would be a participant in this conference. The entire conference would be conducted over the network via terminals (no face-to-face is necessary). Techniques such as split screens and electronic writing tablets, and voice-points (these are electronically controlled audio speaker-microphones combined in one unit) can be used to facilitate the full interaction between students and between the communications and teaching functions of the system. Each user would be able to see what each other user was proposing, and have a say in that proposal. By using a hypertext technique, the original programs would not be lost, and would remain accessible, and yet all the changes ultimately agreed to would become operational. The hypertext mode enables each user to add comments to or make changes to a text (or program), which leaves the original document unchanged, and creates a logical link between changes and the original such that users can see what was changed (and why), and make comments on the changes, and still have access to the original set of statements or program code.

We now have an analogy that can cope with the highest level of autonomy in an organism (eg a primate) where Mind (implicate) has reached such a degree of unfolding that there exists a high level consciousness (explicate). The organism can interact directly with the implicate order, and produce changes there. This is brought out in the analogy by giving the students the ability to influence every other student's responses and to make changes to the system's courseware. These interactions make allowance for the interactions of other organisms. Moreover, these interactions will be ecological (the students are fully interacting

with each other, the course controller and the computer environment), in that they will be between organisms, and they will also be evolutionary, in that they will be between an organism and the implicate order.

THE INFLUENCE OF MIND AT THE EXPLICATE LEVEL

Thus, as biological forms evolve, and especially as the CNS becomes more complex, a degree of local intelligence arises, because some small degree of Mind has become explicated in the organism. This local intelligence allows the organism to play a small but active role in the decision making processes which leads to the further unfolding of explicate forms. Earlier, I explained the process whereby a *shape*, on returning to the implicate order, "modifies" what lies there, and used a simple computer analogy to explain how this might be. This process did not, at that stage, involve any conscious action or purposiveness on the part of the organism concerned. It merely rendered up its shape at death. With the entry of consciousness, an organism acquires the ability (primitive at first) to influence the process occurring within the implicate order. In the computer analogy I offered much earlier on, the programmer developing new software now acquires some limited ability to work at the level of machine code, and can directly change the state of certain hardware registers, and may even be able to alter the instruction set.

In the computer-based communications systems analogies discussed in the preceding section, this primordial beginning of active decision-making is marked by the users of a network terminal acquiring a small degree of local autonomy. That is, the user can alter data and even alter certain aspects (eg, address lists or document formats) of the system's software, but as yet has no ability to influence the host machine's software decision making. The parallel in the AI CAI analogies is the simplest such system. As an example, this analogy would fit the stage reached by, say, the carnivores (eg, the dog).

Eventually, animals with sufficiently complex brains would have appeared (eg, mammalian species), where the degree of consciousness (although far from self-consciousness) was

beginning to have a direct influence on the implicate order. By this I mean that consciousness, as an active agent or outpost of Mind, was in touch with Mind. This became possible when Mind first explicated itself as consciousness. What I am suggesting here is that there was established a ***communications path*** between Mind and consciousness. However, at that earliest stage, the degree of consciousness explicated would not have been sufficient to utilise this communications path. It would have been there in potential only. But, with the steady evolution of consciousness, this direct communications link with Mind would have slowly come into play, in conjunction with the parallel unfolding of ever more complex brains.

To elucidate the role played by this communications path, I use a telecommunications analogy. Any given communications channel can handle a finite amount of data, where this ultimately depends on the bandwidth of the channel. Bandwidth is a measure of the range of signal frequencies that the channel can cope with, without introducing data loss or data distortion. The wider the bandwidth, the greater the amount of information that can be sent down the channel in a given period of time.

At the very first explications of consciousness, the bandwidth of the communications path would have been minimal, and consciousness would have existed in an embryonic form. With the appearance of the earliest of the primates, the bandwidth would have increased to such an extent that it facilitated a flow of information from Mind (as implicate) to consciousness (as an explicate that uses the brain to function through). In, say, an early primate such as a tree shrew, this information would not have been available at the conscious level, but would have influenced the animal's behaviour nonetheless. In Chapter 5, I will return to this concept of a communications path, where it becomes especially important in the evolution of primate consciousness.

In a highly evolved form such as a non-human primate, a very high degree of local intelligence exists and so the degree of local decision making, and hence the degree of local influence, increases to such an extent that the explicated form is beginning to share in the

evolutionary process. What I am suggesting is that this increase in local intelligence is due to more and more of Mind (as implicate) explicating as consciousness. Between two related species (eg between, say, the old-world monkeys and the apes) this increase might not show itself in any large difference in brain anatomy or even in very many specific external behaviours. The major difference would lie in the level of consciousness, which has its roots in the higher degree of Mind that has been explicated. Here, the communications systems analogies are no longer suitable, and the middle level AI CAI system is the appropriate analogy.

The difference due to Mind explicating as consciousness, shows most of all at the human level (for example, between *Homo neanderthalensis sapiens* and *Homo sapiens sapiens*). In particular, it shows up in cultural factors, and would be the underlying cause of differences in social order (eg, from cave dwellings to a megapolis) and in thought processes (eg, from participation mystique to high level logico-mathematical abstractions). In the computer-based analogies, we have arrived at the fully interactive AI CAI system, because consciousness is now an active outpost of Mind. Note that, in using the term outpost, I am not constraining the information flow to that from I to E. Clearly, there is a causal direction from E to I, as explained in the foregoing sections.

This feedback in the E to I direction would be quite limited in the case of the neanderthal, because (in particular) this species lacked speech (this issue will be dealt with fully in Chapter 5). Even within those explanations that remain purely within the explicate category (eg, physicalist theories of culture, such as the gene culture notion of the psychobiologists) the possession of speech is a major factor in the transmission and development of culture. In the model I am developing here, I argue that (to date) speech acquisition was the most crucial aspect of the unfolding of what lay within the implicate order as Mind, and enormously increased the bandwidth of the communications path mentioned above. It led to a much more effective use of this path, and permitted much higher properties of Mind to be explicated. This is seen in the rapid way in which Cro-Magnon (*Homo sapiens sapiens*) drove neanderthal into

extinction, and how rapidly their culture evolved from simple cave dwelling, through mud huts to stone-age fortresses. In Chapter 5, I will explore these socio-cultural issues in greater depth.

Thus, at the local level, we see an increase in local consciousness, which permits a degree of purposiveness, which, in turn, leads to local choice. These acts of conscious choice (no matter how primitive by primate standards) introduce a new factor into the feedback process between explicate and implicate orders. This is so for two major reasons. Firstly, as implied earlier, the element of choice sharpens the process of improvements in the explicated forms in that the organisms of a given species are themselves partaking in the selection process. Secondly, consciousness, as an explicate of the implicate order, itself evolves and gradually becomes a decision-making entity in its own right. In effect, as stated above, it becomes a kind of outpost or agent of the implicate order, and has conferred upon it a certain degree of authority to act locally, and to make decisions that were earlier made wholly within Mind (as a part of the implicate order).

What I am saying here is that, in line with the most sophisticated of the AI CAI analogies, the further unfolding of the implicate order is influenced directly by consciousness, in that consciousness is directly linked with the implicate order. What we see here is the introduction of a higher turn of the spiral of the evolutionary process.

Note again, in this exposition, that there is a two-way process involved. There is the influential information flow from E to I, and the response from I to E. Thus, what I am saying here is not to be understood as saying that the implicate order is no longer involved. It remains involved because everything that becomes explicated ultimately comes from the implicate order. It is not that consciousness (as a high-order explicate) suddenly acquires the power to explicate forms from itself. Only the implicate can enfold that which can become unfolded, and hence become explicated. There is no equivalent process in the explicate order. However, this is not to say that the explicate order cannot acquire the power to cause

certain explications from the implicate order, and even get involved in the processes that occur within that order. In the computer analogies I have used above, no matter how sophisticated the system becomes, the users of it remain users, and do not perform the functions carried out by the hardware-software combinations of the system itself. That is, the system's electronic workings remain at the implicate level, and the users remain at the explicate level. Thus the analogies given retain this important division of roles between the implicate and explicate orders.

A SUMMARY OF THE MODES OF UNFOLDING

At this point it is worth summarising the various modes of unfolding of the implicate order, that we have so far considered, where these are tabulated in figure 3.1. Note that each I-E mode is numbered sequentially, where these same numbers are used in the appropriate paragraphs below.

1. Initially, the only form of explication taking place gave rise to that which those of a physicalist persuasion regard as matter of some kind or another (be it subatomic or molecular). The analogy used at this stage is the ink-in-glycerine apparatus controlled by a simple clockwork spring with a constant rate escapement device. There is no direct influence back from explicate to implicate. This mode would have been in operation for long aeons. At this stage, there is no suitable computer analogy. Note that, at this stage, only the Law of Unfolding (LU) applies. (A primordial form of the explicate law of complexity is working, but because this law is related to the Darwinian notion of natural selection, it does not really come into play until biological forms arise. For that reason I have not tabulated it at this stage).

2. In the next mode, we are dealing with the explication of biological forms. Here the degree of complexity has reached a level whereby what is further unfolded is some function of what has already been unfolded. The analogy here is transformed up a step where the behaviour of the spring's escapement is modified by what is unfolded in the glycerine. Here, also, the first of the computer analogies comes in, with the E-mail only system, where the message

I — E MODE		LAW INVOLVED *	ANALOGIES	
			INK-IN-GLYCERINE	COMPUTER
Automatic unfolding of I ①		LU	Clockwork: linear escapement	None
Presence of E influences I ②		LU	Clockwork: escapement controlled by ink drop detection	E-mail only
SHAPE OF E INFLUENCES I	Minimal local autonomy ③	LU + LA Plus the first influences of the law of complexity (LC)	Clockwork: escapement controlled by shape of drop comparison with shape criterion	E-mail + database access
	Increasing local autonomy ④	LU + LA Also the explicate law of complexity has increasing effect	None	E-mail + database access + ability to make changes. Also, the simplest of the AI CAI systems
	Early entry of consciousness and high local autonomy ⑤	LU + LA + LC	None	AI CAI: with problem – solving ability, tracking of student performance etc.
	Consciousness is now an active outpost of I (mind) ⑥	LU + LA + LC	None	AI CAI: Fully interactive mode where users can change the system's software

Figure 3.1 Relationship between the various analogies used and the Implicate (I) – Explicate (E) modes

* LU (Law of Unfolding)
 LA (Law of Approximation to an Ideal)
 LC (Law of Increasing Complexity)

sent at any time is some function of the messages sent and received at an earlier time. At this stage of unfolding, it is the mere presence of explicated forms, not their specific content, that influences what is further explicated. This mode of operation applies where biological forms attain to some simple degree of organisation as, for example, in simple cell structures.

For the moment, I leave the numerical sequence of modes, in order to restate certain key features which come into play at mode 3.

A notion of the appropriateness of shape arises, which entails three separate aspects: the LU, the LA and the LC. Between them, these three laws govern an organism's fitness in relation to its environment. This involves the organism's shape being or becoming appropriate to that environment. But it also involves that shape approaching closer to the implicated ideal.

Ultimately, this appropriateness of shape is measured against some set of criteria, where these criteria are stored within the implicate order, as governed by the LA. In terms of fitness to an environment, some shapes will not be conducive to survival, because the responses made by that organism to its environment are maldaptive or inappropriate. This, in turn, leads to a final shape in that organism that fails to meet the implicate criteria for that stage of unfolding. Other shapes might be neutral in this regard and neither fail nor actively release higher quality forms. Yet other shapes would be those that met the stored criteria and so acted to release new forms that enhanced survival and the overall evolutionary trend.

At this point, I introduced death as the mechanism by which a given organism's shape gets back into the implicate order, so as to have influence there. That is, at the death of an organism, when the final shape is reabsorbed, it is used to influence the implicate order.

I now return to the numerical sequence.

3. Beyond the level of organisation where basic biological forms are being explicated, basic organic structures come together to form living creatures, initially of a very simple type (eg, the amoeba). At this point, I introduced the notion of **shape** (as in a piece of bent fencing wire) to describe a basic quality of a given biological form. Recall that I am using the term shape metaphorically and not literally. The form unfolds from the implicate order with some initial shape. This is because shape, as an explicate property, is always derived from some aspect of the implicate order. The starting shape of a given organism is subsequently modified as the organism lives out its life. The ongoing shape amounts to a record of the history of that organism, and is the means by which changes in the organism are recorded.

At the level of simple animals (eg, the amoeba), having a minimal degree of local autonomy, the suitable analogy was that of a stack of disks instead of the single glycerine container, where each disk contains a variety of enfolded ink drops within a range of drop types. In this case a microprocessor contains the criteria for each range of ink drop shapes. The parallel computer analogy was that of E-mail plus access to some kind of database. At this point, the LA begins to have influence. Note, also, at this stage, the law of increasing complexity begins to take effect.

4. At the next level up the evolutionary chain, we might have Arachnida (eg, a spider). Here, there is an increasing degree of local autonomy, and a fair degree of local mobility and dexterity. The suitable analogy at this stage is that of the E-mail, plus database access, plus the ability to make changes to the database. Also, at this stage, the simplest of the AI CAI analogies is appropriate. Note that, from this mode on, there are no suitable clockwork analogies. Here, LU and LA are joined by the law of increasing complexity, related as it is to natural selection, where it comes to have greater and greater influence.

5. Next up the evolutionary process we have animals that are displaying some degree of consciousness and a high degree of local autonomy. As argued earlier, I see this stage as starting somewhere around the appearance of the amphibians. It is certainly evident by the

time we get to, say, Aves or Mammalia, and is prominent in species such as canines. The analogy at this stage is that of the middle level of AI CAI. LU and LA are in effect as before, but there is also a subtle interaction with the law of increasing complexity, as consciousness begins to slowly act as an outpost of Mind.

6. Finally, we get to the primates, where the degree of consciousness is such that Mind has an active outpost in the explicate realm. Naturally, there is a spectrum of consciousness involved here, ranging from that possessed by, say, the tree-shrew, to that possessed by *Homo sapiens sapiens*. Here, only the fully interactive AI CAI analogy is suitable. Also, the interaction between LU, LA and the law of complexity is very subtle indeed.

THE NOTION OF IMPLICATE REGIONS

To me, the fact of order and even of a hierarchical arrangement of inorganic and organic forms within the explicate realm is undeniable. Yet, for me, it is also a mystery which biology and evolutionary theory has done little to shed light upon. In the ideas I have proposed above, there is a relationship between what has already been explicated and what is further to be explicated, where the mechanism involves a variety of modes of feedback between the explicate realm and the implicate order. I have said that there are two major laws operating within the implicate order: the Law of Unfolding (LU, the natural tendency of the implicate order to unfold) and the Law of Approximation to an Ideal (LA). There is also the explicate order law (LC), which governs the trend toward increasing complexity in explicated forms (atomic, chemical and biological). This latter law also ultimately governs the fitness of organisms to their environment, in relation to criteria that reside within the implicate order.

At this point, I make a small digression. An implication of what I have said above is that the Darwinian notion of fitness to survive is a by-product or epiphenomenon of what I am calling LC (the law of Increasing Complexity). That is, I argue that the Darwinians are positing a law-like quality to what is really an epiphenomenon of the real underlying law (LC, as it interacts with LU and LA). I argue that the Darwinians err in more than merely applying physicalist

categories (where there are in fact explicate and implicate categories), but are inventing laws for entirely the wrong phenomena. An example will make this error clearer. If I invented a law for felt temperature (eg, that detected when I touch a hot object) instead of a law of molecular motion, I would be isolating the wrong phenomenon. This is because felt temperature is an epiphenomenon, whereas molecular motion is the true phenomenon. There is only the one law within Darwin's theory, that of natural selection due to the press of the environment, which determines fitness to survive. There is no law of increasing complexity within the Darwinian scheme. Yet, there has clearly been an increase of complexity of biological forms over evolutionary time. Darwin's single law does not explain this fact, because an increase in complexity is not a logical outcome of fitness to survive. Afterall, within its own environment, the simple amoeba was fit to survive, and did not need to become more complex. I offer, instead, a genuine law, which has governed the increase in the complexity of biological forms. While the workings of this law are purely explicate, it operates in conjunction with two implicate laws (LU and LA), for without them, I argue that there would have been no increase in biological complexity.

To return to the original discussion, the issue of there being implicate laws that govern fitness to survive, points toward there being suborders or regions within the implicate order, which are the basis of the externally perceived order. Bohm (1980) speculated on the idea of there being regions or suborders within the implicate order. He also speculated that there is a relationship between these regions and aspects of the explicate order. While he did not take this line of reasoning very far, the idea is a useful one, and I take it up here to explore a possible relationship between what we see as orders of increasing complexity and organisation in the explicate realm, and these implicate regions.

Because there is no one-to-one relationship between the implicate order and its explicates, we cannot readily map the obvious and tangible order of the explicate realm onto the implicate order. What we perceive as the explicate realm (ourselves being part of that realm) is constrained by our space-time conditioned sensory apparatus. But space-time has no

meaning within the implicate order (this pair, recall, are explicates and unfolded like everything else). Any attempt at mapping the explicate onto the implicate would ignore Bohm's insistence that the implicate order is non spatio-temporal and is such that everything is enfolded in everything else.

Yet, despite these difficulties, I envisage a definite relationship between the regions Bohm speculates upon, and the order we perceive in the explicate realm. I reason thus:

- (a) The Law of Unfolding ensures that the implicate order unfolds as explicated forms.
- (b) What is explicated ensures further explication, by the various feedback processes described earlier
- (c) The explicate law of increasing complexity (of explicates due to environmental pressure and natural selection) and LA combine to bring explicated forms closer and closer to ideals located within the implicate order, as evidenced by the orders or classes of living forms seen in the explicate realm.
- (d) Because the explicated forms seem to be hierarchically arranged, the implication is that, at least, there are regions within the implicate order, and that these regions contain ideals that in some way relate to the manifested order of the explicate realm.
- (e) The implication of (d) is that there are hierarchies within the implicate order.

The manifested hierachical order I refer to in the explicate realm is that which ranges from postulated entities such as quarks (the basic building blocks of subatomic particles if one takes a physicalist view), through atomic elements, molecular forms, chemical compounds, biological structures, entire organisms, the varying degrees of sentience and awareness, levels of consciousness, and ending (at least on this planet) with human societal structures.

To express these ideas in another way, I am saying that there is a relationship (not a one-to-one correspondence) between the types of forms emerging in space-time, and the regions within the implicate order. In my view, it is Mind which is most likely of the highest implicate region, and hence is the last to be tapped. With the introduction of sufficiently complex central nervous systems, the higher regions of the implicate order could be tapped where, eventually, Mind itself began the process of explication (as consciousness). Thus, at this new turn of the spiral, the explication shifts up from the more obviously tangible forms of Life to that intangible (yet explicate) form we call consciousness.

The final mode of unfolding so far described entails the appearance (at first miniscule) of consciousness and the purposiveness it confers. In this way, consciousness slowly unfolds (as an explicate of Mind) to become an active agent of Mind within the explicate order. Here is where the computer analogy really comes into its own. Firstly, a computer data communications network (eg, E-mail) was used, but this was found inadequate because it could not analogue the way in which explicated organisms actively interact with their environment and develop as a result. To overcome this, I then used as an analogy a computer based data communications systems having a data base as well as E-mail. In this analogy, some users can change data and some can even change the systems software. Finally I introduce the AI CAI analogy in the form that users can change not merely the database but the software program itself, to fit the case where (as in the primates, human especially) the local autonomy is very high, and where consciousness is directly interacting with the implicate order.

A DUAL EVOLUTIONARY PROCESS

Thus, what we see in the latter phases of this overall evolutionary process is a dual process of explication. As stated, in its earliest stages, there was only the fairly automatic unfolding of what is enfolded, wherein it is only the more obviously physical forms that are evolving. However, at a certain point, the process becomes dual in that, alongside the evolution of the

tangible explicate form, there emerges an evolving intangible explicate form -- consciousness. The evolutionary process had to continue in a singular fashion until a certain stage of unfoldment of the tangible form had been reached (especially the unfolding of a CNS), before the dual process could begin. This is because consciousness needed a certain complexity of CNS in which to reside and through which to operate. In the initial onset of this dual phase, consciousness (as an explicate of Mind) would have been embryonic (see the analogies for the third mode in Figure 3.1, where the shape-controlled escapement and E-mail + database access apply). But as it began to make its presence felt, it worked to modify the form of the CNS and so permit more and more of Mind to be explicated (in figure 3.1, this period starts with the middle of the AI CAI analogies). By modifying the CNS, I am referring to a process that occurred over many generations, and not to some modification that occurred within a single individual's life-time.

In this way, Mind itself is explicated, not as a tangible form such as flesh and bones, but as a very high order of explicate. The earliest explications of Mind would have been very simple (analogous to a very low degree of user autonomy in a very simple AI CAI system). At the human stage of evolution, the explicated form of Mind is a very high degree of consciousness. In my view, this explication of Mind, as individual consciousness, is only an initial step. No doubt, this process of the explication of Mind is still going on, but speculation as to where it will lead to, and what ultimate explicate of Mind will emerge is far outside the scope of this thesis. Nonetheless, it is my thesis that more and more of Mind will continue to be explicated, and has certainly not reached anything like full explication with human consciousness.

The two allied but parallel processes of explication (physical form and consciousness) are naturally out of step at any given evolutionary phase. This is because the evolution of the tangible form began so much earlier in space-time, such that the physical structures of species had become quite refined and complex, well before consciousness had barely begun to form and evolve.

THE UNFOLDING OF THE IMPLICATE ORDER

Figure 3.2 shows the relationship between the implicate and explicate orders in both the earlier and later phases of the overall evolutionary process. It is difficult in a diagram of this sort to show the temporal element in a dynamic way. It is even more difficult to see that what we regard as time is itself an explicate of the implicate order, just as is space. Yet this temporal factor is a key to understanding the overall process. While within the implicate order there is no space-time, it is in space-time that that which lies enfolded unfolds. In its attempts to explicate all of itself, the implicate order is constrained by its own explications, especially that form we know as time (recall the earlier analogy which utilised a simple clockwork escapement). Although it is the ultimate source of all that will eventually be explicated (on this planet and cosmically), the implicate order is dependent in a complex way upon that which it explicates. Recall from the earlier discussion on *shape* that time is a crucial factor in this, because duration is involved in the formation of the memory trace mechanism (what I have termed shape). This rather difficult point will be explored further in the next chapter, where I specifically deal with the evolution of consciousness and the spectrum of consciousness that results.

In figure 3.2, we see that there are two major axes. The vertical axis is that of time, but also contains a dimension which ranges from the earliest and automatic unfolding process, through the stage whereby that which has already been explicated begins to influence what is further explicated, to where consciousness becomes an active factor in the evolutionary process. In both dimensions of the vertical axis, the movement is from the bottom of the diagram to the top (compare figure 3.1). The horizontal axis depicts two independent processes. In the first (from left to right) we have the directional process from implicate to explicate. That is, the movement from that which is enfolded to that which becomes explicated. In the second aspect, we have the process (from right to left) whereby forms that are explicated die, and the *shape* that they acquired during their lifetime is reabsorbed back into the implicate order, and influences what is further unfolded.

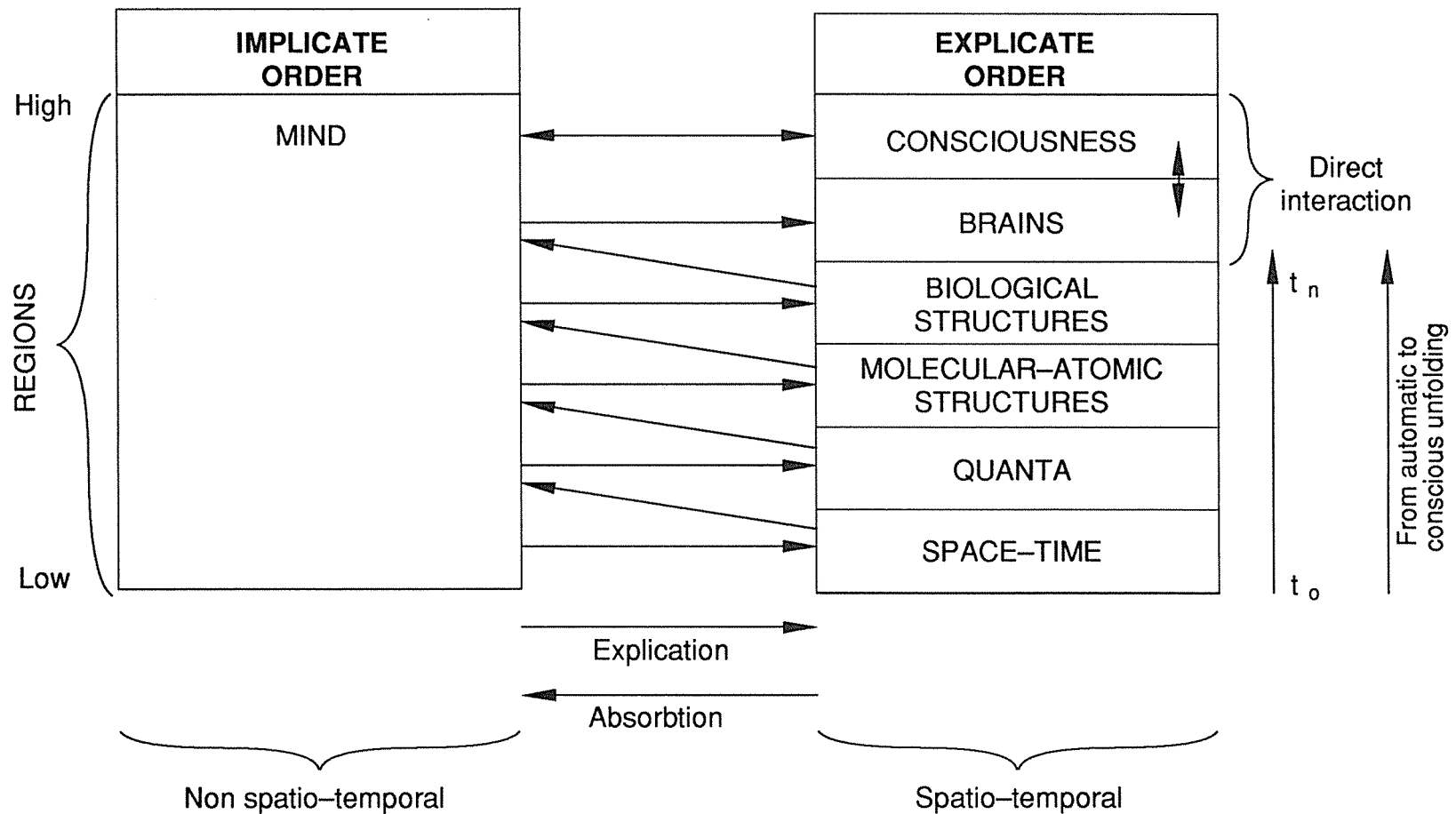


Figure 3.2 Relationship between the implicate and explicate orders in the progressive unfolding of the implicate

Within the block labelled implicate order, I have attempted to show the regions or suborders discussed earlier. In such a diagram, by using axial directions, a hierarchical order is implied. But, note that I avoid the notion of hierarchy within the implicate order, and refer only to regions or suborders. I do this because of the difficulties of mapping the explicate realm onto the implicate order. There are various diagrammatic devices I could have used to relate the implicate regions, one to another, but none of these would help clarify that which will probably remain mysterious for a long time to come. Accordingly, I have simply shown Mind as being at the top of this collection of regions, and have not attempted to define, prioritise or label the other regions. This is because we can have no real conception of the nature of this relationship. All that can be hypothesised is that there must be such regions, and that the more obvious organisational hierarchy of the explicate realm interacts with and in some way reflects these regions.

I have attempted to show a progressive interaction between implicate and explicate with the series of arrows, that ascend ladder-like between the implicate and explicate blocks. The right-pointing arrows depict the direction of unfolding, and the left-pointing arrows the dying of the explicated form back into the implicate. The temporal sequence is shown by the vertical time arrow which goes upward from t_0 to t_n . Thus, space-time unfolded first. In its turn, space-time provoked a further unfolding as shown by the left pointing diagonal arrow. At this earliest of all the stages of unfolding, we cannot say that any shape or reabsorption was involved in this first left-pointing arrow. The most we can say is, that by space-time coming into being, the implicate order had a foothold, as it were, which it used for further unfolding. For this to have occurred, space-time, as an explicated entity, would have influenced the implicate order in some way. However, the mechanism by which it did this clearly could not have been by way of some memory trace (which involves time itself).

At the next level up we see that the implicate order unfolds that which we know as the realm of quanta, as governed by the laws of quantum mechanics. This explication laid the foundations for what we regard as physical matter. At this early stage of evolution, I offer the

view that these quanta themselves were primordial and had not yet given rise to the atomic elements. This was to follow in an evolutionary way.

I concede that the notion of physical matter evolving is liable to be rejected by those schooled in classical and quantum physics. In fact, most physicists would not see the need for such a mechanism, and take the present atomic structural series of the periodic table as a given. I am not saying that this view is wrong. I merely offer an alternative for consideration. As explained much earlier, I will reserve the term **evolution** for that mechanism which governs the increasing complexity of biological forms, along with consciousness when it appears. I use the term **unfolding** for the process by which the basic structures of matter became more and more complex and organised.

The view of matter unfolding seems to me no more outrageous than that of the evolution of biological forms. It is conceivable that, from some primordial atom, what we call matter unfolded according to the implicate-explicate processes I have described. Clearly, this would have occurred in a location other than in this solar system and on this planet, which is the venue for biological evolution as we know it. This venue did not exist at the time I refer to, and is constituted of components that emerged at a far later time. Clearly, in the view I offer, the unfolding of matter had to precede biological evolution, but as to when and where this happened is a matter I would be unwise to speculate upon.

Thus, in the view I put forward here, the unfolding of inorganic matter is the precondition for biological evolution. It occurred by a combination of the LU and the explicate law of increasing complexity. This shows that this latter law has been in operation since the first appearance of the explicate realm, but in a fashion that is not as readily understood as in the case of biological forms. Note that figure 3.2 does not show this law as coming into effect until halfway down the figure. This is because this figure deals only with the evolution (ie, unfolding) of biological forms and that of consciousness. The discussion here deals only with non-biological matter (the forms ranging from quanta, through atomic to molecular), and

concerns the earliest phase of the automatic unfolding of that lying enfolded within the implicate order.

With the first unfolding of the most primordial biological form (perhaps some form of protoplasm), we had what we have come to regard as living forms. But the distinction between non-living and living is probably false, where the real distinction is one of the degree of organisation at the explicate level, and one of hidden order at the implicate level. In a compact diagram of this sort, it is not possible to show the progression within the band I have labelled biological. If one broke this down into a more specific and detailed picture, one would see many arrows snaking upwards, each level up showing a greater degree of complexity and organisation of form. While brains are clearly a biological form (of stunning complexity) I have shown this form separately because of the special place it has in the evolution of biological forms (at least on this planet). I speculate that the brain, from the most primitive to that of humans, is the explication of a very high region within the implicate order, second only to that of Mind itself.

Up to this point, the various mechanical analogies that I have employed sufficed to show how the explicated form influenced what was to follow. With the emergence of brains, the whole process shifted up to a new level of operation, where the purely mechanical analogy is no longer suitable, and I had to introduce a series of computer based analogies. In the diagram of figure 3.2, I have tried to capture something of this shift by showing a two-way linkage between the brain and consciousness (as a very high order explicate), and also by connecting the consciousness block to the upper region of the implicate block (Mind) by a two-way arrow. The former depiction shows that there is a special relationship between a brain and consciousness. The latter shows that consciousness is an active agent of the implicate order.

Note that, along the vertical axis of the explicate block, I have bracketed consciousness and brains. This is a further attempt to distinguish between the modes of evolution that had

operated prior to the appearance of brains, and what followed once consciousness had a vehicle through which it could actively express itself. This is not to say that there is no interaction between the vertical bands of the explicate realm lying below brains. There clearly is. But this lesser interaction is much more mechanical-automatic as shown in the choice of analogies used earlier. The brain is a special structure, and has a special relationship with Mind (as implicate), in that it is through brains (on this planet at least) that Mind explicates itself at the biological level.

The brackets also imply a sharp distinction between the purely physical evolution of species, and the evolution of consciousness. I speculate that it is this distinction that underlies the essential difference between orders of phylla. Zoology focuses too readily upon the anatomical differences, and ethology focuses too readily on the measurable outer behavioural differences. These foci lead to the classification of species as seen in standard texts on evolution, biology and zoology. But in this, there is a failure to include the large inward differences of consciousness as a criterion for classification.

CONSCIOUSNESS AS AN ACTIVE AGENT OF EVOLUTION

The notion of consciousness becoming a stable (though intangible) explicate form in its own right is crucial to my thesis of the evolution of consciousness. Without it, one is forced to see consciousness as a mere by-product of the explication of the implicate order. In fact, one could not really claim that consciousness evolved as such. Such an admission would suit the physicalists because they cannot even entertain the notion of consciousness as a thing in itself let alone the idea that it might evolve. However, in the scheme I am positing here, consciousness does evolve. It evolves because, in the first place, it comes into being as Mind finds suitable forms in which to explicate itself. Having come into being as a stable explicate form, it begins to participate in the explication of more complex physical forms, and so undergoes changes within itself.

Thus, in the same way in which there became established a relationship between what lay implicated and what became explicated as a physical form, there arises a parallel relationship between Mind (as a special part of the implicate order) and consciousness as its explicate. It is this that Figure 3.2 especially intends to depict. That this relationship emerged later in the evolutionary scheme of things was determined by the fact that consciousness needed adequate forms within which to reside and operate through. That is, at least on this planet, a brain of some degree of complexity was needed.

The most primordial brains (eg, those possessed today by simple worms) would have been little more than a ganglia of nerve cells. In the views offered here, such a brain is not complex enough to manifest Mind in the sense of the purposiveness I have discussed earlier. I believe that it is reasonable to assert that, in terms of consciousness, there is a considerable difference between that in a worm and that in a human. This, of course, goes back to the definition of consciousness. A key factor in this definition entailed the notion of a self that was aware of its own actions and could exercise purposiveness.

This capability has been demonstrated to a high order as far as humans are concerned (even though not always used wisely). In my opinion, it has not been demonstrated to anything like the same degree as far as worms are concerned. Using this example with the worm and human as end points on some scale of consciousness, I can establish a spectrum of consciousness. Looked at in this way, it is clear that consciousness has changed significantly across geological time. It is immaterial to my argument that we still have worms around today, along with humans. As explained above, there is a distinction between adpation and adaptability. It just so happens that today there are still environments that suit the rigid adaption of the worm, so why should it have disappeared? Other species have not been so lucky, as in the case of the dinosaur.

Along the spectrum I have delineated is a series of brains ranging from the bundle of nerve ganglia of the worm at one end, to the indescribable complexity of the modern human brain at

the other. In parallel with this series of brains is a spectrum of consciousness, ranging from that possessed by a worm, which amounts to a rudimentary sentience, to that possessed by a human adult that society has classified as being of a high order of genius. In positing this spectrum, I am not saying that it began with the worm or that it ends with human genius. Far from it. But to keep the notion simple, and to reduce the degree of pure speculation, I am deliberately confining myself to this spectrum. After all, it is wide enough to permit an exploration of the notion of an evolving consciousness. Indeed, some would say that there is a gulf between one end and the other. Certainly, it makes it very difficult to compare the two degrees of consciousness.

However, simply positing such a spectrum of consciousness does not demonstrate that there was an evolutionary process at the root of it. This spectrum could conceivably have come about by other means. For example, in the physicalist scheme, because consciousness is merely a by-product of form, then consciousness at any given stage of evolution merely reflects the complexity of the form. That is, in this view, consciousness is not a causal agent, it is simply the outcome of the increasing complexity of biological forms, brains especially. But, as made clear in Chapter 1, I challenge the validity of the physicalist view, arguing that it is not dealing with the correct category of things to be able to have explanatory power.

It is just possible that one could accept the notion of an implicate order, and of a spectrum of consciousness, yet still hold that consciousness has not evolved, but that the spectrum simply reflects the complexity of what has been explicated. This amounts to arguing that the implicate order unfolds purely of its own accord. However, this approach ignores the fact that, in the implicate-explicate scheme, as developed by Bohm, consciousness is a key notion. That is, as expounded in Chapter 2, consciousness plays a causal role in explication at the quantum level. In my thesis, I have simply extended Bohm's basic notions to include biological forms (brains in particular), and reasoned from this that consciousness has played a causal role in their unfolding from the implicate order.

I have taken the idea of consciousness as a causal agent, as far as it can go in this chapter. In Chapter four, I will present a detailed case for a spectrum of consciousness, and examine the literature on, and theories in support of, the evolution of consciousness, in relation to the implicate-explicate processes discussed in this chapter.

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CHAPTER 4: THE SPECTRUM OF CONSCIOUSNESS AND ITS EVOLUTION

In this chapter, I will look at specific theories of the evolution of consciousness. However, before I proceed, it is worth recapitulating the arguments I have used so far in this thesis.

In Chapter 1, I explored the physicalist position and looked briefly at the developments within this tradition. I argued that, at root, the physicalists regard the states described by such terms as mental, consciousness and mind, as reducible to states of physical matter in general, and the neural structures and processes of the brain in particular. In the most recent developments of the physicalist tradition, the battle is between the eliminativists (those who believe that Folk Psychology has no scientific value, only a colloquial-come expediency value) and the functionalists (those who believe that Folk Psychology plays a valid role, but that the functions it posits are performed by neurological rather than mentalistic structures). In that chapter, I showed that the physicalist argument allowed that the entity which was common to both x and y in the identity equation, to be something other than physical matter (even though this tradition would not be happy with that line of reasoning). I used this loophole to argue that the something to which x and y both refer is not matter or mind, but some thing that encompasses both.

In Chapter 2, the point of departure was the something in the identity equation which is neither matter nor mind. That is, I explored the nature of what the physicalist regards as the root of reality. In that chapter I looked at classical, quantum and relativity physics. Using David Bohm's (Bohm, 1980) views as the basis, I explored the concepts underlying the notion of an implicate and explicate order, where that which the physicalist regards as the only reality is the space-time explication of that which lies hidden within the implicate order. The goal of Chapter 2 was to establish the plausibility of David Bohm's concept of an implicate-explicate order. This concept is not only plausible, however, but essential. Without it there is no resolving the difficulties raised by quantum mechanics, and neither is there any way in which classical, quantum and relativistic theories can be reconciled.

In Chapter 3, I explored the implications of Bohm's concept of implicate-explicate orders for a wide range of disciplines (eg, physics, biology and evolutionary theory). Extending Bohm's theory, I developed a series of analogies which showed how the implicate order unfolded, and how this unfolding could be influenced by the explicate order. In particular, I speculated regarding the unfolding firstly of space-time, followed by atomic, chemical and biological forms, where in each category there was an evolutionary process at work. These speculations led finally to considering the nature of consciousness, as the explicate of Mind (of the implicate order), and to the possibilities of consciousness acting as an agent of Mind, and in so doing evolving as an entity in its own right. Thus the present chapter.

In Chapter 3, I felt it necessary to stress that I was not throwing down the gauntlet to such disciplines as physics and evolutionary theory. Most of what was put forward there was offered as a series of interesting possibilities. I make no such apology for the next two chapters, however, because what I present there lies at the root of my thesis. That is, from this point on, I am no longer exploring how evolutionary explanations in various disciplines might go were the implicate-explicate distinction valid in all the ways I claim for it. On the contrary, I will now be arguing that the implicate-explicate distinction defeats the physicalist position, and offers considerable explanatory power as to the nature and evolution of consciousness.

THEORIES OF THE EVOLUTION OF CONSCIOUSNESS: AN OVERVIEW

Without being unduly species chauvinistic, it seems that it is the human brain that gives the greatest explication of consciousness on this planet. Thus, it is the study of human consciousness and its evolution that this thesis focuses on, without dismissing the importance of non-human forms of consciousness and their likely evolution. As there is a great variety of theories on the evolution of consciousness, only a few of the key theories can be dealt with here, with the aim of reviewing and critiquing the selected literature, and trying to see how these theories relate to the model I developed in Chapter 3.

Martindale's review

Colin Martindale's (Martindale, 1977-78) useful, review of theories of the evolution of consciousness provides a good starting point, where Martindale says that theories of the evolution of consciousness are based on four basic contentions:

1. There is a logical continuum of states of consciousness or types of thought.
2. This continuum is a developmental one, such that across the course of human history there has been a progression along it.
3. This developmental progression was necessary given certain initial conditions.
4. Examples of more primitive states of consciousness may be found today, as in preliterate peoples.

Martindale says that theorists have used four sources of supporting data: archeological-historical evidence and documentation; ethnographic data on contemporary primitive societies; observation of children based on inventing an analogy between a child's consciousness and that of human consciousness at the dawn of human kind (this is known as the recapitulation thesis); and introspection. Yet, from this same starting point, two quite different approaches emerged which Martindale calls **intellectualist** and **holistic** respectively. In the former, mental evolution is seen merely in terms of the accumulation of knowledge, whereas in the latter, there is postulated a systematic alteration in consciousness over time.

In the two approaches that Martindale has identified, there is a parallel with the two major views held in psychology regarding the nature of intelligence. In one view it is argued that there is no intrinsic difference between the seeming highly intelligent person and one of

seeming low intelligence, and puts the measured differences down to accumulation of knowledge. Many of the earlier tests of intelligence covertly made this assumption, because they were loaded in the verbal domain, and tended to measure acquired knowledge, rather than any innate factor (Anastasi, 1982). This amounts to the intellectualist position. In the other view of intelligence, it is held that intelligence tests measure something innate, without denying that knowledge is also a factor in this measurement. Researchers such as Cattell (1963) argued along these lines, with his notions of *fluid* and *crystalised* intelligence, where the former is an innate ability that can deal with essentially new problems, and the latter is the repertoire of information, and cognitive skills-strategies acquired in the course of experience. This same is true for the holistic theorists, who argue that consciousness itself is innate and has evolved, but do not deny that humans have accumulated knowledge over historical time.

Using Martindale's basic definitions, I cannot regard the intellectualist view as truly relating to an evolutionary trend, because it deals more with ignorance and attempts to reduce it, rather than with a qualitative change (Martindale's own conclusions). I hold the view that, knowledge and its accumulation is only one outcome of Mind as it explicates itself (as consciousness) in the sensory world. It may, in the end, turn out that knowledge per se is a relatively unimportant explication of Mind.

Martindale cites the holist theorist Werner, who saw the mental development of individuals (or entire peoples) following an orthogenetic principle, meaning that evolution is a directed process and not random. This is opposed to views that evolution is the result only of natural selection. The orthogenetic principle involves an increasing differentiation in patterns of thought, meaning that there is a movement away from a few simple thoughts to an increasingly rich pattern of thoughts. There is also a move to hierarchisation. That is, as the patterns of thought become more numerous, they become arranged along hierarchical lines, with overarching concepts controlling the top level of the hierarchy, where there are nested within these high-level concepts, lesser concepts, and so on down the hierarchy. All this is another way of saying that thinking moves from the syncretic to the discrete, and becomes

ordered into hierarchical levels. Primitive thought was rigid and labile, unable to alter its response to the environment yet easily thrown off track, whereas modern thought is flexible, yet stable in goal pursuits.

The holistic schools, in general, converge on these points, where there is an equivalence between primary process, pre-logical, mythic, right-hemispheric modes of consciousness, wherein all relate to a primitive condition. Overall, there is postulated a shift from concrete, perceptual, emotional modes to abstract, conceptual, rational modes. Martindale cites a variety of authors from as far back as 1911 to recent times, who used cross-cultural evidence to support this shift in consciousness. In general, the holistic schools see cultural, societal, scientific, religious, artistic, political and economic evolution arising out of the underlying evolution of consciousness.

But not all have agreed with this view. For example, Martindale cites Karl Marx, who inverted the causative chain by insisting that mental evolution was conditioned by socio-cultural structures which were, in their turn, the product of economic structures. That is, mental evolution is a consequence rather than a cause. However, the evidence from modern social psychology points to all other factors (eg, socio-cultural) as being consequences of underlying psychological factors.

However, while I side with psychic causation view, I also see that it can lead to an extreme reductionist position in which all socio-cultural functions and structures collapse into psychological causes, and these in turn collapse into biological ones, hence into psychobiological thinking. But such reductionism is not a necessary consequence of this line of thought. While I believe that Marx's inversion of the causal chain is unjustified, and that psychological factors are the truly causative ones, it is possible to avoid the reductionist trap. My model does not fall into the this trap, because I see psychological factors (via consciousness as a high order explicate) as the explicate of some thing that is implicate. That

is, in my model, biological forms are seen as modes of expression of consciousness, rather than being reducible to them.

We can use Martindale's dichotomy of intellectualist and holistic theories to classify and explore a variety of theories of consciousness and their evolution. This is not to say that any given theory readily fits wholly within one or other category. However, the essence of Martindale's distinction is that the intellectualist theories are basically empiricist, in that there is only experience and the learning that goes with it, and the holistic theories are innatist in that there is a something there to evolve in the first place. The more blatantly intellectualist theories are less in evidence today, where they were particularly a product of the British Social Anthropological movement (Martindale, 1977-78). However, there are a few theories that lean in the intellectualist direction, and I will cite two examples of them first, then move onto the more obviously holistic versions. In this, I do more than simply present the literature, because I highlight the strengths and weaknesses in these theories and compare them with my own views. In this way, we can gain useful insights and lessons from the mistakes of these theorists.

INTELLECTUALIST THEORIES

A sociobiological bias

Because of its essentially sociobiological bias, I classify John Crook's (Crook, 1980) ideas as falling into the intellectualist camp. While he makes a valuable contribution to the literature on consciousness and its evolution, he remains reductionist, even though he opens his book with an effective challenge to the biological-only view of human consciousness. His key idea is that a person is the result of adaption to a progressively more social life. He arrives at this view from a discussion and comparison of different types of prehuman social life and human cultural systems. Crook argues that a theory that deals with the change of one psychobiological state to another must:

1. Deal with the nature of this change;
2. Explain the increase in complexity with time and allow for the basic continuity underlying the emergence of novelty; and
3. Account for how later stages serve similar biological strategies as at lower stages, yet employ more complex mechanisms (cf, hunting as done by wolf and human).

Crook then focuses on self-consciousness, saying that it depends on language, yet emerged in prehuman primates.

The first part of Crook's book shows strong academic leanings to ethology and his interest in the evolution of the social systems of birds and primates. This treatment is sociobiological with its emphasis on population genetics, and natural selection, with an attempt to show how ethical behaviour evolved from reciprocal altruism in prehuman primates. Crook says that there is no point in time at which man emerges as a distinct entity operating with social or cultural mechanisms that are entirely separable from those of a biological level. He argues thus because his sociobiological leanings embrace a basic physicalism, whether he admits to it or not.

Crook then discusses the evolution of the self-process in terms of biostrategic goals and constraints on learning, and also what it means to be an autonomous, self-conscious individual in society. To argue this, Crook invokes an amazing range of authors (whose views could hardly be said to be in accord) from Freud, through Milton Erickson to Krishnamurti. In part, Crook's book is an apology for sociobiology, and an attempt to bridge the gap created between mainstream psychology and the blatant reductionism of some earlier sociobiologists. In this respect, I feel that he is successful. But this does not mitigate his thinly veiled allegiance to physicalist thinking, no matter how subtly presented. I argue thus, because

sociobiology's basic thesis is that, ultimately, it is the genes that determine human behaviour, no matter how complex the behaviour. Even behaviour such as reciprocal altruism is explained in terms of genetics, in that such behaviour is reduced to genetic dispositions (eg, altruistic genes) as argued by Trivers (1971). I argue throughout this thesis that there is more to human behaviours (eg, altruism) than the maintenance or enhancement of a gene pool.

There is a sense in which Crook fails to deal with the evolution of consciousness, in that he focuses on the development of personality and society. Also, he reduces human intelligence to adaptive behaviour. This notion of intelligence might be valid for lower mammals, but is not true for higher mammals, and is certainly not true for humans who not only adapt to, but change their environment and adapt it to their social needs. Moreover, Crook does not address the role of cognition and the increase in intellectual capacity since *Homo erectus*. He also fails to deal with the evolution of thought and knowledge systems, which are evidence of the evolution of consciousness.

Art and the evolution of consciousness

Herbert Read (1954) is difficult to place unambiguously within the intellectualist category. However, his emphasis on experience and biological urgency, rather than on innate aspects, in the balance places him in this category.

Read says that the place assigned to art in most texts on the theory of evolution is secondary or even non-existent. Art has been regarded as a late, even inessential, addition to human faculties, as a means of dispersing surplus energy, attracting sexual attention or as an adornment, or as making life more pleasant or more noble. It is interesting that Read says that a paradox of his approach is that art per se does not evolve. Art has a history, and has gone through various developmental stages, but has exhibited a constant factor which Read calls maximum aesthetic sensibility. Read sees this factor alike in the cave paintings of the Neanderthal era, and in modern works of art. He argues that the aesthetic quality present in

the paeleolithic cave paintings has been equalled but never bettered since they were executed.

Read argues against the **play** hypothesis as the origin and basis of art, which postulates that art arises out of playful energy, in the way that children decorate things. He dismisses the play notion because the paeleolithic hunter-painters focused almost exclusively on animal representations. On the few occasions where they depicted human forms, these were done more as a young child might draw a human figure, and not at all with the incredible skill used in a near-by animal figure (known by scientific tests to have been executed at the same time). It is almost, Read says, as though these cave people were making a statement about art itself, and anticipating the play hypothesis and refuting it.

Read goes on to say that, in their beginnings, art and ritual were nigh indistinguishable, because both share the strongly felt emotion or desire that that which seemed dead should live again. For paeleolithic humans, ritual was inextricably bound up with what we now call religion, and related to such issues as fertility and sources of food. At this stage of the evolution of human consciousness, art and religion were an integral organism. Read, leaning on the recapitulation thesis, argues that, like the child, primitive humans lacked the ability to remove images to a conceptual distance, and also lacked the consciousness of a self standing apart from an object or event. There was, rather, a participation mystique. These hunters lived with animals, and had eidetic images of them, that they felt a strong urge to realise in a cave painting, not as play, but as an awful achievement, not to be taken lightly (Read, 1954, page 150).

Once created, the objectified image served to enlarge experience, leading to the rudiments of cognition. In this way, Homo neanderthalensis sapiens learned how to think and so became Homo sapiens sapiens. Read argues that this transition could not have occurred without involving the aesthetic faculty (the ability to project and compare eidetic images), which later became memory images, and later still, intellectual concepts. He argues further

that art is the mainspring and the mental faculty by which magic, religion, science, philosophy and all that we mean by civilisation came into being. He sees in this the progress from instinct through intuition to intellection.

Read invokes the notions of Gestalt Psychology, which says that art is not an idle play of emotion, but a means of helping us find our place in the world, where perception tends to balance and symmetry, and a work of art represents the effort to move toward better and better gestalts. For Read, this implies that aesthetic requiredness is the basic requiredness in biological and intellectual development. He says that, somewhere between the birth of human consciousness and historical records of language, there arose the key phases of ritual, magic, science, religion, ethical awareness, philosophy and so on. This series was due to refinements of perception involving a progressive transformation of perceptual patterns. It is these kinds of statements that produce the ambiguity in placing Read in the intellectualist camp, because here he seems to be implying a more holistic view.

Read argues that involved in this transformative process was imagination. He holds that the acts of the paeleolithic painters did not involve imagination in the sense that we tend to use the word, because they were not creating some thing from new, but recreating on the cave wall what existed in their eidetic memory (in Chapter 5, I will discuss what evidence there is to support Read's assumption that these people possessed eidetic memory). However, Barfield (cited in Sugarman, 1976) envisages two forms of imagination: *primary* (creative perception) and *fancy* (putting together a construct from memory). In science, the creative work lies in theorising (uses primary imagination -- an implicit process), whereas the making it explicit involves fancy. Herein lies the distinction between insight and hypothesis. These two same forms of imagination also act in art.

Barfield argues that fresh insight is a moment of understanding, which is then unfolded in imagination and then appears as discursive reasoning. Insight apprehends the totality, whereas discursive thought explicates its features. Insight cannot be the mere product of

memory and mental training, because it is new and fresh. Rather, it is a perception through mind (nous), and is not reducible because a primary act. Barfield feels that true insight must be free of the conditioning of previously existing patterns. From this, we might speculate that fancy came first, because it involved a construct in memory, and that primary imagination came much later in the evolution of consciousness. This would be in line with Read's views, because he argues that the paeolithic hunter-painters were not using imagination in the sense that we use it (meaning to create something novel) but were recreating on the cave wall pictures which depicted what was still living in their mind's eye, from the day's hunt. It was only as speech emerged, and with it thought processes, that creative perception became possible. These ideas will come up again when we look at the notions of Dewart, where he deals with speech and the evolution of consciousness.

HOLISTIC THEORIES

Because most modern theories of the evolution of consciousness lean toward the holistic category, there are more to choose from and it is easier to place them there.

The self and its brain

In the model of consciousness proposed by Popper & Eccles (1977), a variant on the Cartesian dualistic view, there are three component worlds. These are: the material world (world 1), the subjective world (world 2) and that which is a projection of elements from the subjective world onto the world of matter (world 3).

In world 1, we have the vast range of material forms, ranging from subatomic, through geological-biological to human artifacts. This world corresponds more or less to the explicate order, as defined and discussed in Chapters 2 and 3. In world 2 there are all of the possible states of consciousness, including subjective knowledge, perceptions, emotions, dreams and so on. This, in my model, corresponds more or less to consciousness as viewed as a high-order explicate. However, some of the highest states that Popper and Eccles touch on, appear to be those wherein Mind itself (as implicate) breaks through into the explicate realm

(such as in mystical states). In world 3 we have knowledge in its objective sense, as a record (written, artifactual and so on) of intellectual activity and achievement, such as in philosophy, science, religion and art. World 3 would also, presumably, contain the purely oral tradition prior to the appearance of written languages. This final world is basically of the explicate order, because it consists of tangible matter.

In the Popper & Eccles (P-E) model, communication with world 3 demands the mediation of world 2. That is, it is consciousness that creates and gives access to world 3. This model is essentially epistemological, in that it sets out to explain the relationship between the self and its brain. But the model is also amenable to an ontological interpretation in that the qualitative nature of all three worlds has changed across evolutionary time, and so is implying something about the real nature of these worlds. The mediation between worlds 1 and 2 occurs in the cerebral cortex (what the authors call the liaison brain). That is, although in this model consciousness is regarded as a qualitatively different world from that of matter, it is able to communicate with it via the liaison brain. In this way, the authors hope to avoid the Cartesian problem. However, it is not clear that they do, because they seem only to have changed the location of the interface from Descartes's pineal gland to the prefrontal regions of the neocortex, without having tackled the root Cartesian problem (how any interaction between such different worlds is possible).

Eccles (1981; 1983; 1985) argues that consciousness has properties different from that of matter and as being able to operate separately from the brain. However, he believes that consciousness is derived from the brain. But he argues that if consciousness were entirely dependent on the brain, consciousness would have no function and would not have come into being in the evolutionary process. This he argues from the viewpoint of choice and volition, in that the notion of free-will is important to the P-E model discussed above. While Eccles' arguments are valid enough, he still has not solved the problem as to how consciousness can be both independent of matter and yet communicate with it. It is as though, as a result of brain research, he has become convinced that consciousness is something different and

special, and in certain ways has a life of its own. But, despite this conviction, he is at a loss to explain his findings, and falls into the trap that Descartes created for himself and the rest of us. In terms of the model I developed in Chapter 3, I believe that the P-E model provides a basis for understanding the complex relationship between the explicate realm in general, the brain as a special structure within that realm, and consciousness as an explicate of Mind. But it remains caught within essentially physicalist thinking in that there is no recognition of an implicate order, of which the explicate is a derivative.

A dualistic model

A more openly declared dualistic theory of consciousness is that proposed by Jean Burns (1990). In her theory, the contents of conscious experience are defined by the brain, but their processing may be done independently from the brain purely by consciousness. That is, consciousness is an independent realm, separate from the physical world, as the brain is only the mode by which consciousness expresses itself in physical matter. This is a step beyond the thinking of Popper-Eccles. It is essentially Cartesian but she believes that she has overcome the interface problem.

Burns distinguishes between information content as, for example, stored in a computer system, and awareness of that content (no computer is aware of its content in any sense that Burns understands that term to mean). She also distinguishes between human and animal awareness, as does Eccles (1985), in that animals have sensory awareness but do not have the experience of consciousness as it entails self-awareness. She deals with the thorny problem of how that which is immaterial (consciousness) interfaces with that which is matter by arguing that consciousness is able to identify with certain features of the brain, such that mentation is clearly brain determined. Thus, mentations borrow the properties of the physical world and follow them. She calls this the *principle of identification* (not to be confused with identity theory), and uses an analogy of pouring water into a container where, although the water takes on the form of the container, it retains its own properties.

Burns establishes a principle of choice, which acts as a processing principle, whereby alternatives can be selected. However, these alternatives are presented by and defined by the brain. That is, while consciousness possesses the property of free-will (thus overcoming physicalist determinism) the brain defines (perhaps she means constrains) what consciousness can choose from. Burns also talks of an active gestalt, whereby consciousness can process the brain-defined information in a holistic way. This is in line with the thinking underlying the Pribram model of neurological structures and functions, and their relationship with consciousness (Pribram, 1980, discussed in Chapter 2).

Burns argues that such consciousness has evolutionary implications because it confers choice and an active gestalt, which facilitates choice guidance, model-building, complex cognitions and decision making. She argues that, on the phylogenetic scale, very simple animals (eg, flat worms) do not need a conscious memory function, and may not even need a learning ability. More advanced animals (eg, simple mammals) will need an active memory and be able to learn from experience. Higher phylla still will require some form of mentation to aid in model building and decision making. Social animals will also need conscious memory and a personality. Recall my notion of *shape*, and how this shape comes to be altered during an animal's life time. Burn's progression fits in nicely with the various analogies I used in Chapter 3.

I find Burn's use of the word *need* a bit bothersome, however, for it implies that there is some thing (or some one) which decides whether or not a given animal needs a conscious memory or the ability to learn, rather than these aspects arising in the evolutionary process. This problem does not arise in my model, because all that can ever be lies within the implicate order and is unfolded in an evolutionary fashion by the interaction between that order and its explicated forms, and not by the guidance of some super-agent in the implicate order.

Burns introduces the choice spectrum as the key to evolutionary progress, and uses a computer hardware-software analogy. That is, the simplest of animals are nearly all hardware, with little programming flexibility, where their activities are almost wholly determined by hardwired neuronal structures. Further along the spectrum, some degree of programming flexibility enters with some choice between clusters of pre-programmed activities, but where neuronally wired choice guiders play a dominant role. With further evolution, the degree of hardwiring decreases and software flexibility increases. Choice becomes more and more an issue of consciousness and free will until, with humans, consciousness has the potential of full free will.

The way Burns uses the programming metaphor has some dangers for her theory, in that it is implied that the only source of programming is the material environment. I accept that self-programming can occur in some software packages, and that in some very sophisticated artificial intelligence systems, new software can be entirely internally generated without reference to external inputs. But this does not help Burns, because she is still implying that the software component of organisms comes into being only as a result of the press of the environment. This possible implication is a pity, because she clearly subscribes to the view that consciousness is a separate realm which can presumably generate its own data.

Not even the simplest organism is wholly passive-receptive to environmental factors. Simply by existing in some setting, an animal influences its environment at least indirectly. The higher the phylla, the more there is a shift toward an active influence on the setting. Also, because consciousness is posited as an independent realm in Burns model, it too can presumably do some programming, and is limited only by the relative complexity of the brain that it has to manifest through. That is, Burns analogy of the water taking the shape of the container is very limiting because, in her analogy, the shape of the container remains fixed (the same would be true for her hardware analogy), and is not influenced by the water poured into it (or the software used in the hardware). In Chapter 3, I argued that consciousness plays an increasingly active role in the evolution of forms (especially that of the central nervous

system). That is, via the interaction between explicate forms and the implicate order, consciousness increasingly comes to determine the complexity of the neural structures that are unfolded.

However, Burns (1990) ideas give a valuable insight, and lend support to my model, wherein I argue that consciousness evolves in the sense that it is both constrained by and influences the explicate forms that it uses. In changing the forms that it expresses itself through, consciousness itself evolves in that more of Mind (a part of the implicate order) is able to express itself as the forms it uses become more complex. But, more than this, I argue that an iterative process occurs whereby the greater expression of consciousness (due to an increase in the complexity of the forms used) feeds back into the implicate order and explicates other aspects that lie implicated.

The role of speech

Leslie Dewart (1989) offers some interesting views about the role of speech in the evolution of consciousness. However, his book is rather long and the views he expresses are complex and, at times, convoluted and difficult to follow. Thus, I will extract what I regard as the key points in his thesis.

In his thesis Dewart tries to achieve three things: explain how human speech arose out of infrahuman communication; explain how humans became characterised by consciousness; and explain how this consciousness evolved in accordance with the properties of speech.

Dewart says that, at the biological level, the heart of evolution lies in the genitals, whereas at the human level it is by speech that we replicate ourselves. Humans differ in degree and kind from infrahumans, and human life has a superorganic aspect whose evolution did not depend on the natural selection of genes, because consciousness is not reducible to organism.

Dewart argues that there is a difference between experience and consciousness, in that it was only through speech that humans converted an inborn ability to experience into the ability to experience consciously. Consciousness is both internally and externally directed, and cannot be simply defined in terms of reflection, because memory is invoked. Dewart accepts that natural selection produced the organic basis of speech. He says, however, that natural selection was not the cause of consciousness, and argues that conscious experience of an object is more than the mere experiencing of it, since a conscious experiencing of something entails an awareness of being aware. In normal usage, awareness is synonymous with experience. However, Dewart rightly argues that we can experience without a consciousness (ie, an awareness that we are aware) of what we have experienced. For example, we are asleep, hence unconscious, with a set alarm clock at our ear. At the instant the alarm goes off, we are still unconscious, in that conscious awareness of the sound of the alarm is not immediate. But once awoken by the sound of the alarm we certainly become consciously aware.

Consciousness, argues Dewart, is not a function of the brain, but is reducible to the way humans use their brains. In this sense, consciousness is not genetically determined but is acquired. We inherit the potential to become conscious, but have had to learn to do it. Dewart distinguishes between the recall process in higher animals and in humans. In the higher animals past experience is merely fed back into current experience. In humans, although this also happens, we additionally sense that the past is being re-experienced. That is, our conscious recall permits the reliving of past experience as present experience, which can produce organic changes (there is a two-way flow in the human consciousness-brain relationship not present in nonhumans).

In this way Dewart defines consciousness as an *assertive* experience. What he means by *assertive* is that we must experience objects (hence assert them) as real, even though we only ever apprehend the characteristics of objects. He argues that, whenever an object of consciousness is experienced, the object is thereby *asserted* as being itself and being

whatever it is. This is the only reality we can know. Consciousness cannot operate without regard to the category of reality. So, unlike the animal, we can give credit to the object for its being real.

The assertiveness of speech demonstrates the irreducibility of speech to making vocal sounds and to making communicative signs. In this, Dewart is saying that consciousness asserts reality. By this he means that there is a distinction between the meaning of what we say, and our meaning such a meaning, where the former depends on the latter. That is, we assert when we mean such and such a meaning. By speaking, we hold out that our assertions are true. We take a stand in what we say. An animal may signal something to us that is true, but does not thereby *tell* the truth (similarly with lying). By contrast, with humans, we recognise genuine speakers (whether lying or not) because we recognise in them the *assertiveness* of their speech. Dewart argues that this once and for all sorts out the issue of whether machines think or not, and argues that this question does not rely on whether machines have emotions, feelings etc... They do not assert anything, because they do not consciously experience to be able to so assert. Similarly, we do not communicate with a computer or a book or a telephone, but with the author of the information, and with ourselves.

Dewart says that non-conscious experience (this is the only kind infrahumans can have) terminates with the reception of information from an object, whereas conscious experience goes further, and ends at the object, because it is *asserted as being real*. This does not involve words or thought but is a silent affirmation of the reality of the object. However, to understand an object requires mediation by reason, and is not an immediate sensation or awareness. Consciousness is not so much a cognitive as a *recognitive* process, in the sense that it admits that the facts are the facts. This is a wordless judgment. Consciousness, by reaching out to an object, transcends the mere interiority of experience. This transforms the experiential relation from the mere receptive to ascriptive.

A complex chicken-and-egg situation arises in Dewart's discussion, where he explores whether consciousness or speech came first. His arguments go as follows, in a highly condensed and, perhaps, simplistic form that does not do justice to the complexity of his thought.

Dewart says that the commonly accepted chain of: conscious experience - conceptual thought/word thought - speech is correct in the sense that there cannot be experience or communication without content. So the process must begin with reception of information from a source (inner or outer). However, this chain is incorrect in that communication and experience are repetitions of reality. Also, Dewart dismisses the notion of pure ideas behind thoughts, and so argues that pure conceptual thought is not empirically substantiated. There is no mediation between experience and thought. But, the meaning a thought carries is the meaning it has been asserted with. Meaning does not reside in objects. The term imaginary speech to mean thought, is misleading, because imagination is a far more complex process. Also, we can only imagine based on sense experience, so audible speech cannot be a translation into audible forms of what we had learned to make in imagination only. The implication is that learning to speak is a precondition of learning to think. There is only the one process -- asserting by means of words, voiceless or voiced.

Thus, Dewart appears to be arguing that the relationship of speech to thought is, therefore, the reverse of what the semantic interpretation supposes, and that thought is derived from speech. For Dewart, the chain should be: sense information (conscious or non-conscious) - speech - thought - conscious experience.

But, leaving aside the chicken-and-egg problematic, in all of this Dewart is arguing that speech is irreducible to mere communication, and against the view that thought is merely internalised speech. He disagrees with the currently held view that language shapes human experience and thought, and that grammar shapes the contents of consciousness. Rather, speech shapes the forms of consciousness and determines its properties. As stated above,

Dewart posits the chain of events as: sensory data, speech, thought, then conscious experience. In this, the assertiveness of speech and thought qualify the act of communicating the contents of experience, whereas the assertiveness of consciousness qualifies the act of experiencing such contents. Thought and speech assert mediate, through communicative signs, whereas consciousness asserts immediately. He likens consciousness to a prosecuting attorney where sensory reality has been indicted and arraigned and is now subject to a judicial process.

I remain unsure as to whether he satisfactorily resolves the chicken-and-egg issue and on which side he finally comes down. On the one hand, if he accepts that consciousness preceded speech, then there cannot be experience or communication without conscious experience providing the initial content. This raises questions about just what he means by consciousness (as something apart from speech), and I suspect that he means something quite different from the notion of consciousness I have pursued in my thesis. If, on the other hand, he insists that the ability to experience consciously is the child of speech then, when we learn to *assert* experience in speech, he implies thereby that we learn to assert experientially the objects whereof we speak, and that consciousness arises out of this. This implies that consciousness is inherited and transmitted from one generation to the next by speech. It also implies that the evolution of consciousness is dependent on the evolution of speech.

I agree with Dewart that consciousness asserts reality, in that it acts as the explicate agent of implicate Mind. However, Dewart seems to regard reality as something out there which consciousness has to assert, whereas in my model consciousness and physical reality are both explicates of a higher order (the implicate). In my model, consciousness evolves as an unfolding of Mind, whereas Dewart seems to say that consciousness comes into being as the result of interacting with some external reality with speech utterances.

I believe that Dewart makes a valid case in regard to the irreducibility of consciousness to organism, but he does not satisfactorily explain just what consciousness is other than arguing

that it arises out of speech. Nor does he really say how this type of consciousness can evolve other than through the evolution of culture. Where Dewart does come to the aid of my views is in making such a clear distinction between the higher animals (eg, primates) and humans, in that he makes an absolute distinction between noises that signal something and speech which asserts reality. While I disagree that consciousness is absent in the higher animals (it is not so much absent as of a lower order), I agree that there is a great difference in the quality of consciousness between humans and non-humans, and that speech is crucial to this difference. I will further explore this point in Chapter 5, and show that the development of speech separated out the most recent of protohumans (ie, Neanderthal) and true humans (ie, Cro-Magnon).

The bicameral mind

Julian Jaynes (1976) has developed some interesting notions of consciousness and its evolution. His thesis is that consciousness acts as a right-left brain synthesis and has the relationship of a map to its territory.

Jaynes argues that in a book such as the *Iliad* (shorn of later accretions) the humans portrayed are not conscious in the sense that we are today. He argues that, in the *Iliad*, the term *psyche* means simply breath, and does not mean soul or conscious mind. Similarly, he argues that the term *nous* means plain perception and not some underlying characteristic of consciousness. By this, I understand Jaynes to mean that the people at the time of the *Iliad* had no notion of a reference, and did not think of words as *referring* expressions nor of the things they were the words for as referents of those words.

Jaynes further argues that the world of the *Iliad* was peopled by humans having a ***bicameral mind*** (a mind split in two), with the right brain being the executive part called a ***god*** and the left brain being a follower called a ***man***. The gods ordered men to act (either directly or through the priests) and men obeyed. For the most part, such bicameral minds would function much as the modern mind does, learning, thinking, reacting. However, Jaynes

argues that in the face of the unexpected, instead of a period of intense conscious awareness as with us, in bicameral man there arose god-like commands from the right-brain (as for example when Agamemnon was ordered inwardly by Zeus to attack Troy). Jaynes likens the bicameral mind to the schizophrenic mind, wherein auditory hallucinations (including inner commands) are heard.

Jaynes claims to have amassed a large amount of what he regards as circumstantial evidence. For him, this evidence demonstrates that, prior to 1500 BC (approximately), human action was organised by a mixture of hallucinated voices and hypnotic-like suggestions. He argues that during a crucial period of human evolution, at the very time that language was being acquired by the left hemisphere, the right temporal lobe was pre-empted for the issuance of god-like commands, across the thin anterior commissure that joins the the two lobes like a private corpus collosum. When this area is stimulated in a modern human's brain, the subject hears voices (and sometimes sees visions) addressing him or her.

For Jaynes, the *Odyssey* is a metaphor for the breakdown of the bicameral mind, in which the hero Odysseus represents the new type of man who can defy the gods, wandering freely, and using the serpentine wits of an exiled Adam. Jaynes asserts that it is with the *Odyssey* that we first encounter conscious actors, moral judgements and words (eg, psyche) being used metaphorically for aspects of consciousness.

Jaynes ideas are interesting, and do seem to find some support, especially in the Greek literature that he cites as evidence. However, I feel that the narrow timescale within which he claims humans moved from a bicameral state to that of modern human consciousness is wrong. Assuming his dating of the basis of the stories in the *Iliad* is correct as being around 9000 BC, then we are talking about modern *Homo sapiens* (more correctly *Homo sapiens sapiens*, who dated from around 40 000 years ago). It is more likely that Jaynes' bicameral mind was the characteristic of humans far predating the *Iliad*, and more likely fits what we know of *Homo sapiens neanderthalensis*. Also, Jaynes does not make it clear where the god-

like voices came from in the first place. It is all the more puzzling that he claims this to have occurred in a brain that had not yet developed the full power of speech.

In this respect, I have a particular problem with Jaynes' theory. In his view, these voices came from the right (or non-language) hemisphere of the brain, at a time when neither hemisphere had developed speech, and when we know that it was the left brain (in the greater majority of humans) that developed the cortical structures needed for producing and understanding speech. Thus, it does not make much sense to argue that these voices came from the right brain. It is more likely that they came from the left brain, once the capacity for speech had unfolded. Otherwise, how else could the recipient have understood the commands that Jaynes says he or she heard?

A multidimensional view

Richard Coan (1987; 1989) discusses the different ways in which evolution has been viewed down the ages, where the modern Western view is merely the latest in a long chain. The modern view is that of a linear, monotonic (without variation), upward trend, wherein the notion of progress is strongly embedded. But, as Coan points out, there are other views, such as that of the fall from some Golden Age, or the cyclic view expressed in ancient Hindu teachings and in Chinese cosmology. There is also the issue of evolutionary goals (or the lack of them), where the Darwinian view is goal-less by its very nature, in contrast to most ancient views on evolution which subscribe to a goal and to its exerting a teleological pull.

As an example, the ancient Indian view sees the human goal as union with Atman, and beyond this the union of Atman with Brahman. However, Coan notes that most evolutionary theories (East or West, ancient or modern) are unidimensional in that consciousness is not seen as multimodal. In contrast, he identifies five submodes of consciousness as: **efficiency** (physical, intellectual and societal); **creativity** (spontaneity, flexibility and openness) **inner harmony** (peace, serenity and emotional adjustment); **relatedness** (intimacy, love and community); and **transcendence** (aesthetic and mystical).

Coan, in considering the future of consciousness, feels it is necessary to look back to its origins, which raises the question of consciousness prior to humans. An extreme view is that consciousness is universal (panpsychic), meaning that it is a property possessed by all living forms. The other extreme is that it is present only in mammals, and then only in those with sufficiently developed brains. He speculates that there may be quite different states of human consciousness or intelligence, two major versions of which are *analytical* and *intuitive*. Coan argues that modern humans use mainly the former, whereas many ancient people used (still use?) mainly the latter. He further argues that the Neanderthal had a well developed intuitive or mythic consciousness (as opposed to an analytical consciousness), as evident in their burial rites and art works.

In this, Coan seems to be equating intuitive and mythical consciousness, without actually specifying either mode of consciousness. I do not necessarily agree with this equation because intuition and myth have two quite different meanings. Because Coan seems to be using the terms intuitive and mythical in ways different from those one might first suppose, I feel it necessary to explore these two terms further. This is not necessary in the case of his use of the word analytical, because he uses it in the commonly accepted way of meaning a cognitive process of logically dissecting a situation or problem and using reason to arrive at a solution.

The term intuition is usually regarded (at least in Western psychology) as referring to a process that is in some way inferior to rational cognitive processes, where phrases such as *lucky guess* or a *good hunch* are applied to intuition when this process comes up with the right answers (psychology finds it even easier to dismiss intuition when it comes up with the wrong answers). In Western society, intuition is played down and emphasis is placed instead on reason and logic. In common usage, people often refer to a *gut feeling*, when they mean an intuition. This seems to remove intuition from the category of cognitive things into that of emotive or even visceral things. In fact, in some uses, the term intuition is derogatory, as

when certain males refer to a woman's intuition. However, there are those (in the west -- eg, Barfield, as cited in Sugerman, 1976), who see that intuitive processes have underpinned those creative moments in science, where a breakthrough has been made and an entirely new view has arisen (eg, Newton's insight regarding gravitation). Looked at this way, perhaps intuition relates closely with insight (as the Buddhists argue), and the analytical process only comes into its own once the insight has been had. See again the views expressed by Barfield above regarding the two forms of imagination (primary and fancy), at the end of the section on Read.

The typical Western views about intuition have been reversed in certain Eastern cultures, and certain systems of thought. For example, in Buddhism, intuition is regarded as a superior process, and one to be cultivated, where reason (at least the concrete analytical kind) is seen as restricting and limiting and an obstacle to enlightenment. In this view, intuition is seen as a process that taps some higher source of knowledge, and is therefore a superior form of knowing to that of analytical reasoning, where intuition is a process that leads to profound insights. In much mystical literature (Eastern or Western) intuition is linked with mystical vision, as a process that transcends ordinary states of consciousness. Viewed in this way, intuition is something that apprehends a totality, whereas discursive reason deals with that totality's detail, and even then with only one aspect at one time.

But neither of these major views of intuition can relate to the way Coan is using the term intuition, because he implies that this mode of consciousness predated modern human consciousness, and so was earlier in the evolution of consciousness. Thus, he is using intuition as a label for a state of consciousness which, he says, using a recapitulation notion, is more akin to the thinking of a child than that of an adult.

In Chapter 5, I will look at the notion of recapitulation as applied to the evolution of consciousness. However, to complete the views expressed here, it is the Piagetian scheme that is most often used as the basis of recapitulation theories of the evolution of

consciousness, where a parallel is drawn between the various stages of human development (ie, sensori-motor through to formal operations), and the various stages of primate evolution from the earliest hominids to modern humans.

It is the pre-operational stage in particular that Coan seems to be referring to when he talks of mythic or intuitive consciousness. Two key characteristics of pre-operational thought are: *egocentrism* and *animism*. In the former, young children see everything from their own point of view, and find it virtually impossible to put themselves in another's position. In this, they see that everything in the world was created for their own personal satisfaction, and do not realise that everyone else experiences the same phenomena that they do. The animistic mode causes the young child to insist that all objects have lifelike properties in the same sense that animals are alive. They use this to explain objects in the real world (for example, the sun sleeps when it is not in the sky).

The term myth refers to the narratives that a people use to explain (in seemingly rational terms) their relationship with and understanding of the world around them. Such explanations tend to be regarded as inferior by modern science, in the same way that intuition is regarded as inferior to reason. Again, in terms of recapitulation, Coan is equating the mythic mode of consciousness with that of early childhood (pre-operational stage). While it may ultimately be invalid, it is not too difficult to make a link between this pre-operational mode of thinking and the adult thinking of earlier peoples who used myths to explain their world. This is what Coan is doing when referring to the mythical consciousness of, say, Neanderthals. In Chapter 5, I will look at the evidence to support such views.

Perhaps Coan links these two modes of consciousness (mythic and intuitional), because (for Coan), mythical and intuitive are related in that both modes represent inferior ways of processing reality, and so belong to the dawn of humanity. However, leaving aside the inferiority or otherwise of these two modes of thought, one might argue that both modes tap into some underlying knowledge source, which might be the collective unconscious that Jung

referred to. I will pick up this particular point again in Chapter 5, where I look at Jung's notion of the collective unconscious and archetype.

To summarise, I believe that to equate intuitive and mythic modes of consciousness is invalid, because they are clearly two different things. Their common ground lies mainly in regarding both modes as something that predates mature human thinking, and as some thing that we have (or should have) outgrown. It is this sense that Coan equates them. But, in my view, intuition is not so readily dismissed as a mode belonging to the past. In Chapter 5, where I explore the mode of interaction between Mind (as implicate) and consciousness (as explicate), as it moves into its truly human stages, I will consider modes of consciousness such as intuition and mystical insight, and argue that these represent a higher turn of the spiral. On the other hand, I accept the recapitulationist view that mythical thinking represents an earlier mode of consciousness, which has been largely replaced by analytical reason, as used in science. However, I see Jung's notion of the collective unconscious as relevant to the issue of myths, and will raise this issue again in the next chapter.

In our view of what is primitive, not only is there ethnocentricity, but theriomorphism (regarding people as more like animals than human). Coan argues that even eminent psychologists (eg, Jung) and social scientists in general fall foul of theriomorphism.

Coan goes on to say that a major change was to a settled agrarian mode of living (some ten thousand or so years ago), out of which, much later, the city state emerged. At the core, was an increasing self-awareness and awareness of a separated existence. From the choice of acting in either a practical or imaginary reality arose the fact of will.

Coan points out that the modern western world demands a rational conscious mode, and classifies other waking states of consciousness as abnormal. He speculates that some of these states may have been the norm for earlier peoples, and might even include those states currently labelled as schizophrenic. This present age is the age of egoic consciousness. Pre-

egoic consciousness was characterised by heard voices of command (see the earlier section on Jaynes' views on the bicameral mind). Coan argues that a key characteristic that emerges in the literature on primitive consciousness is the lack of a clear differentiation between subject and object, giving a mystical participation in nature (participation mystique). Related is the pre-operational stage of Piaget, as discussed above. Linked also is what Coan calls the syncretic mode of global, undifferentiated perception. By syncretic he means the associationist type of thinking that occurs in the pre-operational stage, where accidental association takes the place of logical or causal connections in the mind of the young child. The global and undifferentiated thinking he refers to occurs at an even earlier stage (sensori-motor) where the infant cannot distinguish between itself and its caregiver. As will be seen in Chapter 5, these issues are not as clear cut as Coan would have them be, because there are considerable difficulties in reconciling the recapitulation view with the facts of palaeoanthropology.

A SUMMARY: CURRENT THEORIES OF THE EVOLUTION OF CONSCIOUSNESS

It is useful at this point to summarise the various theories discussed in the preceding sections. I will then go on to relate these models with my own model, as developed in Chapter 3.

Martindale's overview

Colin Martindale talks of two broad theoretical frameworks for theories of the evolution of consciousness.

Intellectualist: In this the difference between conscious and pre- or non-conscious is one of degree of accumulation of knowledge.

Holistic: In this, consciousness is an innate property, which some entities possess and others do not.

The intellectualist model is basically empiricist and the holistic model is innatist.

Intellectualist

Two theorists are reviewed: Crook and Read.

John Crook: Crook leans on sociobiology, but broadens it beyond the narrow confines of earlier sociobiological theorists. He tries to explain factors such as the development of personality and culture in terms of biological dynamics. However, he never really gets away from the underlying tenet of sociobiological thinking which is that everything is ultimately determined by the genes.

Herbert Read: Read's views on art are less intellectualist than those of Crook, but still far enough away from holistic to place him here. Read leans heavily on the recapitulation thesis, and places peoples such as Neanderthal at Piaget's pre-operational stage. He disagrees with the views of art that see it either as recent and inessential or as play. Rather, he sees the art of proto-humans as the spring board to a fully human consciousness. He argues that aesthetic requiredness is the precondition in the biological and intellectual development of humankind.

Holistic

Five theorists are reviewed here: Popper-Eccles, Burns, Dewart, Jaynes and Coan.

Karl Popper and John Eccles: In the Popper-Eccles model there are three worlds: the material world (world 1), the subjective world (world 2) and a projection of world 2 onto world 1 (world 3). Communication with world 3 requires the mediation of world 2. Mediation between

worlds 1 and 2 are via the liaison brain (located in the cortex). While consciousness is held to be different from the brain, it derives from the brain. Volition and free-will are regarded as key factors in the evolution of consciousness.

Jean Burns: Burns holds that while the contents of conscious experience are defined by the brain, the processing of these contents can be done independently of the brain by consciousness. She uses a principle of *identification*, in which consciousness identifies with the brain in much the way water identifies with a container. Choosing is an action performed by consciousness but the alternatives are determined by the brain (via sensory inputs). The evolution of consciousness arises out the action of the active gestalt that is consciousness, where choice guidance, model-building and decision-making are key factors. Simpler phylla are almost wholly hardwired, whereas higher phylla have a software capability, hence can learn and change.

Leslie Dewart: Dewart ties the evolution of consciousness to the acquisition of speech. He argues against the reducibility of consciousness to biology, while admitting that consciousness cannot have an existence separate from organic life. Conscious experience of an object is more than merely experiencing that object, because consciousness entails being aware of awareness. He argues that speech shapes the contents of consciousness and determines its properties. Dewart holds that the information chain should be: sense information (conscious or non-conscious) - speech - thought - conscious experience. In this, the assertiveness of speech and thought qualify the act of communicating the contents of experience, whereas the assertiveness of consciousness qualifies the act of experiencing such contents.

Julian Jaynes: Jaynes argues that prior to modern consciousness, the human mind was bicameral (split between the two cerebral hemispheres). Consciousness acts as a left-right brain synthesis, having the relationship of a map to its territory. In the bicameral condition, the right hemisphere acts as a god, and the left hemisphere as the obedient follower, where voices

of command issue from the right brain into the left. He argues that a book such as the Iliad shows the bicameral nature of consciousness at that time, whereas the Odyssey shows that a change occurred, and the bicameral mind broke down, giving modern human consciousness. (That is, the gods were defied and the right-left brains became an integrated whole).

Richard Coan: Coan discusses various notions of evolution, showing that the commonly held Western view is not the only valid view. He posits a multi-dimensional view of consciousness, having five components: *efficiency*; *creativity*; *inner harmony*; *relatedness*; and *transcendence*. In considering the evolution (and future) of consciousness Coan relies on the recapitulation thesis. He talks of "intuitive-mythic" consciousness as representative of proto-humans such as Neanderthal, and "analytic" consciousness as representative of modern humans, where the former relates to the Piagetian pre-operational stage. Coan regards the shift to a settled agrarian existence as a key factor in the evolution of consciousness.

CURRENT THEORIES IN THE LIGHT OF THE IMPLICATE-EXPLICATE MODEL: A SUMMARY

In regard to the evolution of consciousness, Martindale's fundamental distinction is valuable, where he talks of the intellectualist and holistic views. I do not feel that the intellectualist view makes much of a contribution in that it deals solely with accumulation of knowledge. This is not an evolutionary process in itself, any more than the knowledge an adult acquires in the course of a life time is evolutionary. It may be one outcome of the evolution of consciousness in that, to the extent that consciousness evolves, the capacity for a wider range and greater depth of knowledge increases. But educational psychology shows very clearly the distinction between knowledge and understanding, where knowledge can be acquired and displayed, without an accompanying understanding. The end-of-year examination room is a good venue for this type of phenomenon, where facts are regurgitated but not necessarily understood and probably forgotten once the examination is over.

Bringing the intellectualist's view down to this scale is, perhaps, a little unfair, because they are not talking solely of facts to be stored away and then retrieved. Clearly, they accept that there has to be a cognitive framework within which these facts are conceptually ordered. But, the fact remains, that knowledge (no matter how well organised or applied) is not an adequate dimension on which to measure the evolution of consciousness. For example, it cannot explain the distinction that authors such as Coan (1987; 1989) and Read (1954) make between the consciousness of Neanderthalensis and modern Homo sapiens sapiens. Their argument is that Neanderthal consciousness is captured more adequately by comparing a young child and an intelligent adult, than by comparing an ignorant person and a knowledgeable person. This is because the mode of consciousness of Neanderthal is regarded as parallel with that of Piaget's pre-operational stage, where the amount of organised knowledge is not a key factor. At the other end of the spectrum of the evolution of human consciousness, knowledge would be just as inappropriate a measure. Rather, it would be the manner in which knowledge could be manipulated and processed that would be a more adequate measure, along with the form the outcomes of this process took.

It is the holistic approach that seems to be dealing with what I regard as the evolution of consciousness, because it takes into account all of the many facets of the entity we call consciousness, and tries to see how these have changed across the epochs that separate us from, say, Homo erectus. While the child-adult spectrum is useful, there is the danger of construing developmental issues with true evolutionary ones. When we compare the consciousness of Homo neanderthalensis sapiens with Homo sapiens sapiens, we are usually making a comparison between adults. To say that the average cave-dwelling adult was operating at, say, Piaget's sensori-motor stage is very misleading, because it ignores the fact that, within Neanderthalensis, there would have been a great developmental difference between a very young child and a full grown and competent adult. That is, there would have been a clear developmental trend, just as there is in Homo sapiens sapiens.

Even the distinctions made by Jung, such as along the primary-secondary process spectrum are misleading. Both types are present in modern human adults, and Neanderthalensis must have possessed some sort of goal-oriented thinking (as evidenced by the achievements of their cave paintings). The notion of cognition as moving from syncretic to discrete, and from rigid-labile to flexible yet goal-stable seems a better yardstick (see the reference to Werner's views, as cited by Martindale). Certainly the movement away from concrete image-based thinking toward cognitive abstractions is an evolutionary trend that many researchers and authors have identified.

All of the authors cited above, whether addressing consciousness itself or the evolution of consciousness, have made valid observations where these are not readily dismissed. It is useful to summarise those which can be explored in terms of my model.

(a) The Popper-Eccles model shows that consciousness has to be given some independent status, where this assertion is based on the neuroscience findings of Eccles. This is not the same thing as insisting on a fundamental dualism or dichotomy between consciousness and brain (traditionally, between mind and matter). In fact, although Popper-Eccles strongly assert the independent existence of a self (aside from its brain) they do not actually come right out and say that this self is immaterial. This same trend appears in the views of Burns. Burns explores this with her computer analogy, where the brain is the hardware and consciousness is the software. However, the model of Burns does not show how or in what way the software is really different from and independent of the hardware. Underlying these views is the conviction that consciousness is not simply a state of matter (as the physicalists have it), but is an entity in its own right.

(b) The models reviewed here also make it clear that there is a very complex interaction between the purely physical (external) world, the brain and consciousness. The P-E and Burns models bring this out nicely. They also bring out the notion of the

brain as a mediator between consciousness and physical reality. Burns analogy of the brain as a water container is interesting, and certainly conveys the idea that the form taken by consciousness (analogised by water) is in some way determined by the brain (analogised by a container). However, this analogy is rather rigid in that it does not recognise that consciousness plays an active role in its relationship with the brain.

(c) With most of these authors subjectivity is given full status, as are alternate states of consciousness not usually recognised by the reductionist psychologist. Burns and the P-E model bring out the notion of volition and choice, as being a major characteristic of consciousness (as compared with the more mechanistic activities of the brain). Burns' phylogenetic progression is interesting, and shows that consciousness has played an evolutionary role, where memory and learning are key factors. This relates to my notion of *shape*, and to how this shape comes to influence the evolutionary trend.

(d) It is clear that we must distinguish between the evolution of consciousness itself and socio-cultural developments down the ages. While this is not an easy task, it is necessary because it is my view that the former is the cause of the later. However, the complex interaction between what is unfolded as consciousness and the arising of societal forms, makes an understanding of the evolutionary trends among primates so difficult to come to terms with.

(e) The question of the evolution of consciousness is clearly connected with the evolution of speech. It is not clear whether the earliest of the cave-dwellers had speech. But Read (1954), for one, speculates that they did not and instead used imagery in an eidetic way that (in modern human adults) is rare today. This would support Dewart's view, that pre-human consciousness was more a matter of intense and immediate awareness or experience rather than self-awareness or, as Dewart puts it, conscious experience. Consciousness emerged as a mediate between direct

experience and cognitive forms such as speech. But this discussion tends to ignore the neural apparatus that goes with producing speech. In other words, the acquisition of speech must have been accompanied by changes in the neural structures of the brain. I will pick up this point again, in the next Chapter, when I look at the relationship between the evolution of consciousness as an agent of Mind, and the neural forms that emerge from the implicate order.

(f) I agree with the essence of Jaynes' (1976) basic thesis, but I disagree with his timescale, because I cannot accept that the voices he talks of occurred so recently in the history of human kind. I believe that the bicameral phase that he talks of occurred much earlier than the time of Homer or the ancient Greek world. It makes sense to me that it appeared with the appearance of human speech. That is, with *Homo sapiens sapiens* (eg, Cro-Magnon), where it seems the capacity for speech first emerged. There is also the problem I referred to earlier, in regard to voices coming from the right brain in a species that had not yet developed speech.

Many of these theories, notably Coan's, raise important questions about the modern notion of evolution with its assumptions about ever onwards and upwards, and the implicit value judgements involved. These views of evolution assume that there is directionality and some imbedded cosmic intent, such that the process we call evolution is leading all life toward some final goal. This implies several things. Firstly, that there is a single goal (rather than many possible goals). Secondly, that this goal is desirable (or if multiple goals are feasible, then only one is worth the effort). Thirdly, that the goal is known in advance. Fourthly, that life's forms can be pushed (or pulled?) toward that goal. These might seem reasonable assumptions, but the problem lies in giving any non-question begging answer to them. In most of the literature on the evolution of consciousness, this difficult question is tactfully avoided or dealt with superficially.

In Chapter 5, I will try to answer some of these questions by first considering the palaeoanthropological evidence, then using the model I developed in Chapter 3.

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CHAPTER 5: THE EVOLUTION OF PRIMATE CONSCIOUSNESS

In this chapter I will look at the evolution of primate consciousness and, in particular, the evolution of consciousness in the hominid branch as it leads to *Homo sapiens sapiens*. Initially, I will consider the evidence gathered by palaeoanthropology, so as to set the factual scene. I will then look at this evidence in the light of the implicate-explicate model that I developed on Chapter 3 and attempt to show that my model has explanatory power.

PRIMATE EVOLUTION

The study of primate evolution involves a number of disciplines, and is one of great complexity and even controversy. For example, there is the well publicised and ongoing dispute between Richard Leaky and Donald Johanson regarding the place occupied by the skeleton Johanson found, that he called *Lucy* and classified as *Australopithecus afarensis* (Lewin, 1987). In particular, the study of primate origins and evolution involves the discipline of palaeoanthropology, in which I claim no speciality. However, while the material I present here cannot do justice to this vast area of study, I have tried to cite current primary sources and give as recent a view as possible. The main intention in this section is to provide a framework of factual evidence within which I can use my implicate-explicate model to explore the evolution of primate consciousness, and to demonstrate its explanatory power.

Geological eras

To get the duration of primate evolution in perspective, we need to set it against the greater backdrop of the geological eras. The earliest era of relevance to the evolution of life on this planet is known as the **Primary era**, and extends approximately from 600 million to 270 million years *before the present* (BP). About half way through this era (between the Silurian and Devonian periods) the fishes appeared, and toward the end of this era the amphibians and reptiles appeared. Next is the **Secondary era**, which extends approximately from 225 million to 135 million BP. This era saw the full emergence of the birds and mammals (somewhere between the Triassic and Jurassic periods). The **Tertiary era** which followed is

an important one for my thesis, because it covers the periods within which the primate emerged and the earliest hominids appeared. This era ranges from around 70 million BP to 2 million BP. In order of appearance, the periods within this era are: Palaeocene (70 million), Eocene (60 million), Oligocene (40 million), Miocene (25 million) and Pliocene (12 million) where the bracketed figures show when the period began in BP. The final era is the **Quaternary era**, the era we live in today, which began some 2 million BP, and comprises the Pleistocene which occupied most of this era, and the Holocene which started about 10 000 BP.

Within the Pleistocene there were four glaciation periods, from *Gunz* (began some 1 million BP), through *Mindel*, *Riss* to *Wurm* (the most recent, occurring between 60 000 and 40 000 BP). The Pleistocene, with its glaciation periods, was a time of unprecedented geological, climatic and vegetative change, of which three key factors had a significant effects on hominid evolution. Firstly, the topography changed drastically, leading to the formation of great lakes, afforestation, wide variations in weather patterns and a much more fertile soil. Secondly, there occurred the extinction of the huge mammals (eg, the mastendon, mammoth, great armadillos and huge wolves), removing a definite hazard for nascent humans. Finally, there was a great influence on hominid migration patterns, which was paradoxically restrictive and liberating. While the hominds of that period were confined within certain narrow temperate bands, they were also able cross ice bridges and so move into geological regions which would otherwise have remained inaccessible.

Pre-hominid evolution

Harry Jerison (Jerison, 1973) has done some important work in regard to the evolution of the brain and intelligence. He argues that throughout most of vertebrate evolution, the degree of *encephalisation* (increase in brain size) has not been overly important, because the behavioural adaptations of this range of species were accomplished with approximately the same total amount of brain tissue relative to body size. That is, in these earlier vertebrate species, the brain appears to have been a conservative organ.

At this point, I should mention that there is a relationship between brain size (as measured by cranial capacity) and brain complexity. That is, when considering only fully matured animals of any given species, the larger the brain the more complex it is. This is an important point for two reasons. Firstly, brains do not fossilise, and so we have only the empty skull to go on when studying fossil finds. Thus, from the shape and size of the skull, and internal imprints within it, we must make inferences about the brain that occupied that skull. Secondly, the fact that brain size relates to brain complexity is important to my thesis, because in my model neural complexity is a direct function of the amount of consciousness explicated. That is, I have a link between fossil skull finds and the explication of Mind, as consciousness.

Jerison reports that a dramatic shift occurs with the appearance of the mammals. The oldest fossil endocast of a mammal (dating back to 150 million BP), shows that it has already attained four times the encephalisation of that of a reptile. Recall that, in Chapter 3, I argued that the earliest signs of consciousness occurred somewhere around the reptile period. An even greater increase in encephalisation occurred about 70 million BP when mammals began to invade the daytime niches (here the term *niche* refers to that environmental setting a given species occupies).

Jerison goes on to say that while the reptiles were dominant (some 200 to 70 million BP), the mammals had to remain nocturnal creatures, and so developed a keen sense of hearing. This entailed a cortex that could perform certain computations and abstractions on codified data. When they emerged as daytime animals, the sense of vision had to come up to the same level of operation as that of hearing. In fact, in the mammal, the sense of vision has largely moved from the retina (the pre-mammalian focus) to the visual cortex. This led to the senses being located within the cortex. Once the mammal began to utilise a similar form of data processing, it became possible for the association areas to pool this information. This, in turn, led to a new mode of cortical processing, which in its turn, underpinned what were later (in the primate) to emerge as the faculties of reasoning and judgement.

Jerison distinguishes between cortical and non-cortical intelligence, where the later is the mode in the pre-mammalian species as, for example, in the amphibians. This is an interesting distinction, and ties in with my view that, prior to the appearance of the mammals, the degree of consciousness explicated was minimal (see the various analogies tabulated in Chapter 3). To make clear his distinction, Jerison cites the frog, in which 90% of the information received at its retina goes directly to a reflex centre, giving it the fast link between seeing, say, an insect, and the tongue flicking out and catching it. Conversely, in the mammal, there is a cortical delay between stimulus and response, which is the price that has to be paid for cortical intelligence and the greater information processing power it offers.

Jerison argues that a key feature of cortical intelligence lies in its construction of the real world, wherein the large amounts of data coming into the senses must be organised and simplified. There developed, in the mammalian brain, the ability to integrate sets of information from different sense modalities. This was done, in part, by labelling these data in a spatio-temporal way in regard to their source in the environment. Jerison speculates that this could have been the forerunner of the classificatory tendency of the modern human mind.

The ability to create abstraction also had its origins in this period. Prior to this, the focus was on the immediate processing of sense data. This mode can be seen in the case of human eidetic memory, where a person can continue to see the picture in the mind's eye, and can continue to explore it for detail. For example, Gray & Gummerman (1975) discovered that 8% of children have eidetic memory, but that this usually fades in adolescence, because abstraction and generalisation take over. Such data are relevant to the study of human evolution, and form the backbone of recapitulation theories. In these theories, there is the notion that the stages of development in a modern human child from infancy to adulthood mimic or reflect the various stages of the evolution of hominid consciousness. I will pick up the issue of recapitulation later on in this chapter.

The primate family tree

To better understand human origins it is necessary to consider the primate family tree. The primate strand began with the primitive prosimians some 65 million BP (Palaeocene), where this branched into the true *Prosimians* and the *Anthropoidea* around 50 million BP (Eocene). The Prosimian branch contains three sub branches, Tarsioidea, Lemuroidea and Tupaoidea, where these respectively led to the present day tarsiers, lemurs and tree shrews. The Anthrodoidea branch has three sub branches, Ceboidea, Cercopithecoidea and Hominoidea. The Ceboidea and Cercopithecoidea led respectively to the old world monkeys (eg, baboon) and new world monkeys (eg, spider monkey). The expressions *old* and *new* refer simply to our present day continents, where the old is Asia and the new is America, and have no relevance to the ages of the various primate strands. The Hominoidea sub branch later split (around 35 million BP -- Oligocene) into *pongidae* and *hominidae*. It is this latter that is usually referred to as *hominid*, and I will follow this convention.

The pongidae led to the great apes (gibbons, orang utans, chimpanzees and gorillas). The hominidae passed through various stages, possibly beginning with Ramapithecus. However, most of such guesses are in some dispute, with palaeoanthropological finds occurring all the time to shed new light on hominid origins and cast doubt on existing views. The basic movement for Homo has been from *Homo habilis* (Hh - 1.8 million BP), through *Homo erectus* (He - 1.5 million BP) to *Homo sapiens* (Hs - 0.5 million BP). However, there is some doubt as to whether Hh is true Homo, where many modern scholars, using the 750 cm³ cranial capacity criterion (Jerison, 1973), see it as *Australopithecus* (some 4 million to 1 million BP).

To add further confusion to this story is Johanson's find (mentioned above) of the Lucy skeleton (40% complete). Lucy was titled *Australopithecus afarensis* (A. afarensis). This primate had a small but human-like brain, it did not use tools, but was fully bipedal, yet could also climb trees, and had human-like teeth. The remains are dated at around 3 million BP (Lewin, 1987).

Of note in all of this is the fact that true *Homo*, when set against the vast backdrop depicted earlier, is a very recent comer to the evolutionary scene. Compare the durations of the Primary and Secondary eras with that of the entire Tertiary, then consider that even the pre-hominids appeared as recently as the Pliocene, a mere 12 million years ago!

Important to the exposition at this point is the Hs strand, which is generally regarded as splitting into two broad sub strands: *Homo sapiens neanderthalensis* (Hsn) and *Homo sapiens sapiens* (Hss). Hsn or the Neanderthals (ex the Neander valley near Dusseldorf) appeared around 125 000 BP, and became extinct around 35 000 - 30 000 BP. Early Hss (eg, Cro-Magnon) corresponds to upper palaeolithic in Europe, and appeared from around 35 000 BP. There seem to be three possibilities. Firstly, Hss and Hsn are two distinct populations, where Hss derives from Hsn. That is, Hsn was the original root, which separated into two groups, where one group became Hss. Secondly, Hss and Hsn are two distinct subspecies, having the common ancestor. Thirdly, Hss and Hsn are one ancestral population, where the ss characteristic survived due to adaptive-competitive advantage. Zubrow (1991) seems to favour the second possibility, in which Hss and Hsn were subspecies of a common ancestor.

Hominid evolution

At this point it is worth looking at the difficulties facing the palaeoanthropologist, so as to better understand the difficulties I face in producing supportive evidence for the claims I make for my model of the evolution of primate consciousness. The information in the next series of paragraphs derives from the work done by Richard Leakey and Roger Lewin as presented in *Origins* (Leakey & Lewin, 1977). For simplicity I will refer to *Origins*.

As *Origins* indicates, the difficulty is that behaviour does not fossilise, and therefore has to be inferred. Some information about behaviour has to be inferred indirectly from fossil hominid morphology and archaeological remains, but this is notoriously incomplete (we have access to only a miniscule proportion of all the hominids that ever lived). Some can be inferred from the behaviour of certain living humans, such as modern hunter-gatherers. However, modern

hunter-gatherers are members of a different species from that of, say, neanderthals. Thus, there is a danger in viewing modern hunter-gatherers as living fossils. Some can be inferred from non-human primates, but there are difficulties here too, because apes and monkeys are species as well adapted to their niches as the early hominids were to theirs. Also, the interaction between phylogeny and environment for any given species, including those of palaeoanthropological interest, produces a unique set of circumstances. There is also the problem of deciding what one wishes to model and explain in hominid evolution: the main factors traditionally have been bipedalism, enlarged brains, intelligence, tool-making, food-sharing, speech, consciousness, social networks, hunting, territoriality, and so on.

Recent hominid fossil finds show that hominid evolution is not a simple unilinear process from the primitive to the advanced, but is a complex process involving cladogenetic speciation (meaning the branching effect of the evolutionary tree), extinction and the coexistence of species. This means that variability has to be explained in terms other than simple chronological ones. Human evolution is not a ladder-like progression from an ape ancestor to modern humans. Rather, it is a bush of radiating populations and species, each having characteristic unique to itself. For example, despite Zubrow's view that Hsn and Hss were subspecies of a common ancestor (as cited above), anatomically modern humans may have predated the classic manifestations of neanderthal. Also, there is the fact that behaviour varies considerably within a species. This has forced a move away from earlier stereotypic species models. Finally, while it is generally accepted that behaviour evolves through the mechanism of natural selection, it is also clear that behavioural evolution plays a significant part in determining overall patterns of evolution (Foley, 1991)

Origins shows that the closest living relatives of hominids are the African apes, the chimpanzee especially, where the split seems to have occurred some 5 - 8 million BP. It is difficult to know whether the shift from the archaic hominids (ie, Australopithecus) had evolutionary significance or whether the principal evolutionary changes occurred only with the appearance of the genus Homo some 2 million BP. However, recall the earlier mentioned

dispute between Leakey and Johanson over *Lucy*. If Johanson is right, it puts Australopithecus, hence Homo, much further back in time, and very close to the split just mentioned. In fact, it could mean that Homo paralleled the great ape branch. However, it is with Homo that this thesis is principally concerned, and so the major focus will be on this genus, but with some reference to the great apes as necessary.

Origins makes it clear that changes in body size are important because these influence a number of energetic, physiological and behavioural parameters (eg, in primates these are brain size, metabolic rate, longevity, reproductive rates, patterns of growth, sexual dimorphism and patterns of locomotion). The relevance of this is that body size can be directly inferred from fossil observation, and hence makes it easier to indirectly infer the related parameters.

Jerison (1973) argues that encephalisation in the primate is related to the arboreal niche. Somewhere around the late Palaeocene and the early Eocene (60 million BP), the primate line of evolution forked into the Prosimians and the Anthropoids (see my earlier exposition). The former were nocturnal, and remained so, whereas the latter became diurnal. This led to a doubling of brain size. Jerison argues that this arose out of taking to living in trees, to evade daytime predators (eg, snakes). But the movement to an arboreal lifestyle demanded enhancement of vision and hand-eye coordination. Out of this arose stereoscopic and colour vision, and an improvement in hand manipulations and perception. Thus, the Anthropoids learned how to extract an object from its environment, examine it, and return it to its place in its surroundings. This led to the ability of seeing the world, not as a continuum of events in a world of pattern, but as an encounter with objects. This, Jerison argues, ties back into the unique way that the primate constructs the real world.

In the last 5 million years, the rate of encephalisation in hominids was unique among mammals. For example, Australopithecus (some 5 million BP) had a brain size of around 450 cubic centimetres, whereas Homo erectus (around 500 000 BP) had an average brain size of

some 950 cm³. These sizes compare with an average brain size of 1350 cm³ in modern humans (from at least 10 000 BP onwards).

Jerison argues that there was a pressure on the early hominds to expand into the predator niche. This produced the need for an enhanced perception rather than enhanced communication. That is, the hominid predator needs to create and retain cognitive maps, because primates do not have the olfactory equipment of, say, the dog or wolf. These changes in the early primate led to an increase in the ability to perceive distinct objects in a real world.

Jerison cites paleontological evidence which shows that an increase in brain size (beginning with *Australopithecus*) included likely expansion of the temporal-parietal association areas. In particular, he argues that it is the angular gyrus which is the only major difference (anatomically) between ape and human brains. This part of the brain is related to converting visual images into auditory patterns. In this, I do not understand Jerison as saying that there are not other anatomical differences between the human and ape brains, because elsewhere in his book, he discusses the speech centres (Broca's and Wernicke's areas) and clearly recognises that these do not exist in the ape brain. Here, I understand him to be talking only about major brain structures and not regions of the cerebral cortex.

Jerison says that there is skull evidence that in *A. africanus*, the amount of brain devoted to the temporal-parietal cortex had increased at the expense of the occipital cortex (some 2 million BP). However, it is not yet possible to date the origin of speech purely from comparative anatomy and paleontology. For example, controversy surrounds the connection between speech and tool-making. In one view, the existence of speech was needed to explain how the complexity level of stone tools remained static for so long. The other view is that this fact proves that speech did not exist at that time. Note, in this context, the distinction between tool use (the great apes use tools) and tool-making, which only the hominds were

known to do. Later in this Chapter, I will return to the issue of tool-making, the periods this spanned and its relevance to the evolution of consciousness.

There is dispute in regard to whether Hsn (neanderthals) had speech or not. Those who argue that Hsn was fully human argue that they had speech, whereas those who claim that Hsn were a distinct subspecies argue that they did not have speech (Maxwell, 1984). It is of interest in this regard that Lieberman & Crelin (cited in Maxwell, 1984, page 272) tried to reconstruct the vocal tract of a neanderthal fossil, and concluded that the hominids of that period (100 000 BP or earlier) would have lacked the necessary anatomy to form the vowel sounds i, u and a, and lacked the ability to nasalize sounds. From this, it could be speculated that Hns could not have had human speech as we understand it. See also the discussion later in this chapter regarding the application of Piaget's stages of thinking to Hsn and Hss populations.

THE KINDS OF EVIDENCE SUPPORTING THE EVOLUTION OF PRIMATE CONSCIOUSNESS

The difficulty in anchoring my model of the evolution of consciousness to the physical reality of fossil hominid remains is that most of the factors that imply the possession of some degree of consciousness do not fossilise. All that fossilise are the bones, and even these are in contention (Lewin, 1987). Not even brains fossilise, where brains give the biggest single clue in regards to consciousness, because it is through brains that consciousness manifests. If brains do not fossilise, then behaviours definitely do not. Therefore, we have to look to remains, other than bones, for clues as to the existence and evolution of consciousness in primates. We can categorise the clues into one of three categories, each of which ultimately depend on physical finds (fossil or otherwise). These three categories are:

Physiological: In this category, of importance we have; brain structure, bipedality, sexuality (eg, mode of copulation, sexual fidelity, and seasonality) and the length of maturation.

Psychological: In this category, of importance, we have; security needs, speech and communication, cognitive factors (eg, reason, concept formation and abstractions), and morals-ethics.

Social: In this category we have; hunting, tool use, habitation (eg, campsites), long infancy, child-rearing, nuclear family structure, male-female cooperation, division of labour, social structure-hierarchy, rituals (eg, burial), division of labour, territoriality, border patrolling, relationships with other groups, art, and religion,

It is worth examining a few examples from each of these categories in order to obtain a picture of early hominid evolution. In general, we can use these categories to delimit the distinction between *H.sapiens* and the pre-human hominids, and in particular use them to make distinction along the *Hs* strand.

Physiological: As already mentioned, brain size increases as we move from *A. africanus*, through *H.habilus* to modern humans. However, although this is a general trend, there are exceptions as in the case of Lucy who, although adult, had quite a small brain. However, she predates *A.africanus*. Thus, the evidence supports a general increase in brain complexity from the earliest primates, through early *Homo* to modern humans. Because I directly relate consciousness to brain complexity, I see in this evidence support for my view that consciousness itself has increased across this same period (some 12 million years). However, note that I do not rest my claim on this alone.

Bipedality is important, and marks the break between *A.africanus*, which was not truly bipedal (ie, capable of a fully upright gait) and *Homo*. There was clearly a transition stage

where early Homo could walk bipedally and yet could still very efficiently climb trees (*Origins*). For example, Lucy (at some 3 million BP) seems to have had full bipedality and yet was also adapted to tree climbing (Lewin, 1987). I will pick up this issue of bipedality again later in this section, when I discuss the social factors.

The mode of sexual copulation marks out a major distinction between true Homo and the great apes. While frontal copulation is probably possible for the great apes, the ape anatomy would make it difficult and certainly uncomfortable, where the natural mode is for the male to enter the female from the rear. Only the truly human form permits (even encourages) frontal copulation (Maxwell, 1984). This is an important factor in the development of the affects and sensuality, because with the possibility of frontal copulation there came face-to-face contact during copulation. This, in turn, would have had a powerful effect on pair-bonding (Maxwell, 1984). Also, the shift from a seasonally regulated sexual activity (as with the apes) to an all-the-year round sexual activity would have given more time for the influence of frontal copulation on pair-bonding, and had an influence on fidelity between pairs. These factors tie in strongly with the emergence of the nuclear family.

Perhaps the most powerful factor of all, in the evolution of hominids, is the exceptional duration nature alots to human maturation. The length of time for maturation of an ape infant is very long compared with that of a high-order non-primate mammal, such as a dog or horse. But even this period is nothing to that required in the human child. Such a lengthy maturation entails a commitment from the caregiver(s) that is without precedent in the non-human animals (Maxwell, 1984). This factor (in conjunction with the sexual factors just mentioned) would have have been the key to the development of the nuclear family, especially as it influenced the respective male and female roles. In addition is the fact that, in the new-born human infant, the brain has barely begun to mature, and undergoes a massive growth spurt outside of the womb, and continues maturing into the late teen years. This is unprecedented even among the great apes, whose brains (along with their bodies) reach full maturation in a few years (Maxwell, 1984).

Judging by the increase in average brain size from *A. africanus* to *H. s.*, it seems likely that, with each new stage along the path to full humanity, the amount of brain maturation that was left to continue ex-womb increased. This increasing degree of brain plasticity appears to have led to the enormously increased rate of encephalisation in the primate branch (see earlier, when citing Jerison), and would have enabled the cerebral cortex in particular to reach the proportions it has in modern humans. Using a computer analogy, the brain of a lower mammal (say a marmoset) is virtually mature, hence fully hardwired, at birth. This, of course, means that the cranial case is also fixed in size at birth, where the bone is all but ossified. Conversely, the brain of the human neonate is virtually unwired by comparison, and highly amenable to programming as a result of environmental impacts. More than this, the skull is still soft (ossification does not occur until the teen years in humans) which permits the brain to increase in size outside of the womb. It is easy to take this fact for granted, and lose sight of its enormous implications. Looked at from a purely bio-environmental viewpoint, it is not difficult to see how this factor of brain plasticity ex-womb led to the phenomenal rate in cortical growth in the primate strand in general, and in *Homo* especially. In my model, I regard this new development in the evolutionary pattern as evidence that a new mode of implicate unfolding occurred at this time, and was a direct result of the feedback from explicate to implicate, as discussed in Chapter 3.

Psychological: Clearly, these factors are closely bound up with the physiological factors just covered. The emergence of speech is bound up with the evolution of the brain, and the heightened plasticity caused by ex-womb maturation would have been a key factor, because it is in the cortex that the speech centres appeared. The heightened vulnerability caused by a delayed maturation would have been a key factor in the evolution of human affects (Maxwell, 1984). The commitment required of the mother (to stay with her offspring and not join the hunt) would have extended the time spent with her child, and influenced security needs in both the offspring and mother. Also, the female would have become much more dependent for food on the male, where prior to extended maturation she would have hunted and

gathered her own food. This, in turn, would have led to females developing traits that secured and retained a male, perhaps for life (Maxwell, 1984). As this appears to have been successful during the course of hominid evolution (and is still the norm in modern humans), the males themselves responded and became more committed to their *family*.

The unfolding of cognitive abilities, such as in concept formation and reasoning, again seems clearly related to the delayed maturation issue, which permitted the cortex to evolve rapidly, facilitating higher and higher levels of neural activity. Wynn (1989) says that the archeological evidence for modern intelligence shows a change in adaptive strategies and organisational abilities at the beginning of the Upper Paleolithic (some 40 000 BP). For example, he cites the ability to recognise that there existed environmental potentials and to communicate these to others. With this went the ability to anticipate events and conditions not yet experienced, where this predated more specific cognitive capacities such as symbolising, art and ornamentation. Wynn argues that intelligence has a behavioural component that must have evolved. He discusses four key behaviours: technology, the use of tools especially; subsistence as for example in seasonal hunting and fishing; exchange systems; and ritual systems, as, for example, in parietal or cave art (the word *parietal* derives from a Latin word *parietalis* meaning wall, hence parietal art, because executed on the wall of a cave).

Wynn says that there are two basic problems: defining intelligence and finding the evidence for it. There is the tendency to confuse intelligence and complexity of behaviour (eg, more tool types means increased smartness). But this would mean that 20th century humans are smarter than 19th century ones, simply because life is so much more complex today (some might argue the reverse!). In this, we tend to find or make measures that corroborate our ideas. Wynn argues that any definition of intelligence in the palaeoanthropological field must do certain things. Firstly, it must enable cross-species comparisons. Next it must permit the assessment of end-products of behaviours, where the original behaviours are no longer available. Finally, there is the need for empirical confirmation from comparative and cross-cultural studies.

Using Piaget's developmental scheme, Wynn looks at the concrete operational (7 to 11 years in a modern child) and formal operational (from age 11 years on) stages, and the archeological evidence to support these operations in hominids. That is, Wynn is favouring a recapitulation thesis in coming to an understanding of hominid development.

At this point, it is necessary to say something about recapitulation theories of intellectual evolution. These theories assume that there is a parallel between the intellectual development seen in a human from infancy to adulthood, and the phylogenetic stages seen in the evolution of primate species. For example, it was popular to draw a parallel between the characteristics of human infancy and, say, the very earliest of the hominids (eg, *H.habilis*), followed by early childhood for *H.erectus*, late childhood for *Homo sapiens*, and so on (Gould, 1977).

The most common human developmental model used in recapitulation theory is that of Piaget's. While the stage concept is what most people think of when hearing of Piaget, the stages are not the core of his theory. The core lies in his view of the nature of intelligence and the process of human development. While it is a structural theory, he never regarded the structures as innate. Rather, the structures are constructed as a result of the interaction that takes place between the individual and its environment. Individuals actively apply their internal organisation to their setting, and if this proves inadequate, they make an adjustment. The result of this ongoing process is a sequence of more and more powerful internalised organisations. It is these that are behaviourally identified as stages (eg, sensori-motor, pre-operational and concrete operations), where each stage seems to occur within a definable age band. While Piaget's ideas are best known in the field of human development and in educational circles, he intended his theory to apply to all development, including phylogenetic development. That is, Piaget always maintained that the ontogenetic sequence informed us about the phylogenetic sequence, hence the popularity of his theory as a basis for a recapitulation theory (Gould, 1977).

However, there are certain limitations attending a recapitulation theory, even when it is based on an ontogenetic theory of intelligence as widely accepted as Piaget's. Firstly, the idea of a recapitulation theory of consciousness or intelligence arose out of the biological equivalent. That is, ontogeny can be seen to recapitulate phylogeny in observing the stages of development in the human embryo (ie, from fish, through reptile and so on). Unfortunately, there is no equivalent embryo to observe in the case of consciousness. Secondly, the ontogenetic base theory (eg, Piaget's) deals with human development from infancy to adulthood, whereas we are dealing with fully mature hominid remains from which to make our inferences regarding the general level of intelligence of a given species. That is, regardless of the referent human developmental stage, we are comparing this with a fully grown hominid. However, even though a given very early hominid adult may be operating at the sensori-motor stage (0 to 2 years), it will have adult attributes which would confer competencies far beyond that of even the brightest human infant. Thirdly, even in a well established ontogenetic theory such as Piaget's, there are children who do not fit the model (eg, evidence of some degree of formal operations at an age when only concrete operations are possible). But, despite these and other possible limitations, the notion of recapitulation is still the only plausible way for us to make a comparison, and thus try to come to some understanding of what the various stages of pre-human hominids were really like in terms of consciousness (Wynn, 1989).

To return to the original discussion, Piaget uses the term *operation* to mean an internalised action that organises cognitive structures. The key feature of concrete operations is conservation, as for example where a child acquires the notion that liquid volume is conserved even though the shape of a container varies. At this stage, the child comes to apply the notion of conservation to many aspects of life, such as to classes of objects, and social relationships. The key feature of formal operations is the ability to take the results of concrete operations and generate hypotheses about their logical relationships. Thus, formal operations are used on hypotheses and generalisations rather than on tangible things (like hand axes).

Wynn argues that concrete operations appeared around 300 000 BP (Acheulean period, where Acheulean is a shorthand for referring any hand-axe technology between 500 000 and 100 000 BP, made by *H. erectus*). That is, there are stone tools in abundance from this period, the construction of which require a minimum of spatial competence. Prior to the Acheulean period, it is unlikely that hominds possessed concrete operations, and would have operated in the pre-operational stage (in the modern child, this occurs between ages 2 to 7 years). High levels of symmetry have been found in the Acheulean period, indicating a Euclidian relationship achieved only at the concrete operational stage (this stage uses reversibility and pre-correction of errors). This feat would be beyond that of one working at the pre-operational stage, where the earlier stage relies heavily on trial-and-error.

Wynn argues that, while the technology of 300 000 BP clearly demonstrates the possession of concrete operations, it does not help with the decision as to whether formal operations was in use. For example, one might cite the refinement of the blade of an axe as being due to a shift from concrete to formal operations. However, as Wynn points out, such refinement can be as much attributed to increased skill and practice as to a shift to formal operations.

However, Wynn says that two post-Acheulean developments are provocative. The first is the appearance at this point of curated tools and the use of environmental facilities. By curated Wynn means *looked after* and *kept*, as opposed to discarded or lost. Curation seems to have appeared beyond the Acheulean period (eg, in Upper Palaeolithic). Wynn argues that, by comparison with non-curated tools, the Upper Palaeolithic tools are the elements of a longer-range technology, which entails forward planning. There is similar evidence from studies of subsistence and the use of environmental facilities. For example, in the Upper Palaeolithic, there appears specialisation on hunting gregarious herd animals and the reliance on fishing. Both activities entail some long-range planning, because fish and herd animals tend to follow seasonal patterns in their migrations and gatherings, which means that hunting or fishing trips need to be similarly regulated. This contrasts sharply with earlier periods, and

shows an element of forward planning. This suggests to Wynn that a shift took place from concrete to formal operations.

Wynn points out that European Upper Palaeolithic hunters carried and traded shells and other raw materials over hundreds of kilometers. There is also evidence of the exchange of information about far-flung resources and conditions, where regional information exchange patterns emerged. This is evidenced by the distribution of certain distinctive artifact styles, and acts as an index of social affiliation. The absolute minimum of competence for this is concrete operations, but its sophistication implies formal operations because, again, forward planning is entailed. However, it is in the realm of ritual, that we see the beginnings of formal operations as a necessary minimum. There is evidence in cave paintings of a deliberately used classificatory system (eg, 91% of the painted bison cluster in the central portions of the cave, and 64% of the bison paintings are associated with horses). That is, the animals, signs and positions of these paintings were grouped according to some abstract common feature, and this requires formal operations.

Social: It was Darwin especially who focused on hunting as that which distinguished humans from pre-humans. This idea carried weight for some long time, but was more recently replaced by the notion that the distinctions lay in those factors more related to the rearing of offspring and food gathering-sharing (Maxwell, 1984). In fact, hunting and tool use came much later in hominid evolution than was originally thought. Prior to the development of hunting, the nuclear family provided the means for developing human characteristics. In this, the mode of habitation was a key factor.

After the descent from the trees some 3 to 4 million BP, when our hominid ancestors became fully bipedal, the first homes were probably under the trees (Leakey & Lewin, 1977 - *Origins*). Initially, this would have consisted merely of sleeping at the base of a tree, with an almost instant readiness to climb back up in a hurry, should a night predator appear. In time this would probably have led to the construction of some kind of shelter, perhaps made of

loose brush and broad leaves, at the base of the trees (even the chimpanzee do this). Beyond this phase, with the steady deforestation, and the movement out of the forests on to the savannas, the home was probably out under the stars. These were little more than camp sites initially, and were not so much homes as dining places, where groups would gather, and perhaps return to (*Origins*)

Some time later, these sites became hollowed out areas with, perhaps, windbreaks as at the Olduvai Gorge in Tanzania, some 2 million BP (*Origins*). The next step was with *H. erectus* and cave life, and it is here that the use of fire is seen for the first time, some 350 000 BP at the caves in Choukoutien in China. Cave life introduced certain constraints (eg, restrained sexual activity, greater care in bodily waste elimination, a need for the disposal of corpses and the control of aggression). Later still, with *H. sapiens*, cave walls became a means for producing parietal art. Around 50 000 BP is found the first house consisting of a scraped out depression, probably covered by hide supported on poles. Beyond this, with the arrival of *H. sapiens sapiens*, many different forms of dwellings appeared (eg, bamboo or mud huts). Along with the changes in the type of dwelling went changes in social patterns and the group efforts needed to survive.

However, despite the generally accepted view that hunting came after the psycho-social factors, in determining human characteristics, it is recognised that hunting moved the early humans into the economy niche, leading to such things as reciprocal altruism, morality and team spirit (*Origins*). Skill in the hunt gave rise to notions of prestige, leadership, ritual, magic and the education of children. The first so-called hunters were more likely scavengers following in the wake of a lion kill. True hunting emerged with the killing of big game (eg, at Olduvai). This move took *Homo* into the social predator niche (eg, like the wolf). These early people formed into nomadic bands some 12 - 50 couples, in which pair bonding gave nuclear families, where this pattern continued for a very long time. In fact, until about 10 000 BP (where the Holocene began), all humans were hunter-gatherers (Maxwell, 1984).

Such ritual and cultural factors are major determinants in the attempt to distinguish between hominid evolution in general and that of human in particular. As an extreme example, a gorilla and human share much the same cerebral apparatus, yet a human infant will respond positively to being placed in a culture consisting of art, belief systems, morals, laws, customs and so on, making it his/her own. On the other hand, the infant gorilla similarly placed will either not respond at all, or even respond negatively (Maxwell, 1984).

Tool use is a final key factor in distinguishing between our human ancestors and the various sub branches of the pongidae branch of the primate tree. This is not to say that the great apes do not use tools. They do, and quite cleverly at times, as for example in the use of sticks by chimpanzee to probe termite mounds (*Origins*). In regard to hominid tool use, there are three major periods that have been identified. **Palaeolithic** which occurred between 1.8 million to 10 000 BP. **Mesolithic** which occupied a similar period to palaeolithic but was confined to North West Europe only. Finally there was **Neolithic** which started about 10 000 BP. This phase finally led into the **Bronze Age**, which started about 3 500 BC.

THE IMPLICATE-EXPLICATE MODEL AND PRIMATE EVOLUTION

In the model I developed in Chapter 3, recall that consciousness emerges as an agent of that part of the implicate order I call Mind. Prior to this emergence, the evolution of biological forms proceeded in an essentially mechanical fashion, by means of indirect feedback or influence by explicated forms upon the implicate order. With the appearance of consciousness (as an explicate of Mind), the entire evolutionary process entered on a new turn of the spiral, and consciousness began the process whereby it would come to have a direct influence on the implicate order.

To understand this new factor, it is necessary to understand that consciousness has a special relationship with the implicate order, because it is an explicate of that region of the implicate order called Mind. Exactly what Mind is is beyond this thesis to speculate upon. I

argue only that it is a very high region of the implicate order, that has enfolded within it that which manifests in the explicate order as all that is colloquially referred to as mind (note the lower case m which distinguishes it from the more technical term Mind that I use in my model).

Recall that I referred to the explication of Mind as a parallel activity with that of the earlier but ongoing evolution of biological forms. This dual phase cannot come into being until appropriate biological forms have been explicated. Namely, neural structures of sufficient complexity had to be explicated before Mind could explicate itself as consciousness. For simplicity, I shall deal only with evolution on this planet, and hereafter refer to these structures as brains. But having said this, we must accept it as species chauvinistic because, elsewhere in the cosmos, Mind may have found other appropriate forms in which to explicate itself. I speculate that the foundations of what became complex neural structures were laid down prior to the explication of Mind, and these came into being as a result of the more mechanical form of unfolding that I described in detail in Chapter 3. However, with the formation of these structures into what could be called a brain (though primordial), the quality of the **shapes** being reabsorbed into the implicate order were such that they began to influence the region of Mind. At this point, I argue that the evolution of the neural structures received a tremendous impetus, and their rate of unfolding accelerated markedly. This, in its turn, led to the explication of greater degrees of Mind in an accelerated fashion.

At this point, note that, in using the term accelerated, it is by comparison with the extremely slow process that was occurring before Mind began to explicate itself. However, at this earliest phase of the explication of Mind, it might have taken many millions of years to go from a neural structure so primitive as to be unable to express consciousness, to one that could do so with some degree of effectiveness. Thus, at first, though the process underwent acceleration, the rate of change was initially slow. However, at some crucial point, the degree of complexity of animal brains crossed some threshold point, and consciousness appeared. Once this point was reached, the rate of change would have speeded up again, and the

quality of evolving life forms would have been seen (by some mythical observer) to be changing across many generations instead of across many millions of years.

This increase in the rate of unfolding of Mind as consciousness would have been observable in terms of an increase in mobility, of improved sensory apparatus, of adaptability and of the power to modify the environment. These, and other changes, would have been the result of the complex interplay between each generation's averaged-out interaction with its local environment (leading to some average *shape* change), and the implicate order. In this, consciousness would begin to evolve, and slowly take on the role of an active agent of Mind. At first, I envisage that consciousness would play only a minor role. Using a computer analogy, at this stage, the hardwired aspects of the computer would dominate, and the software would be primitive and have little processing power. That is, instinctual and reflexive actions would dominate the animal's activities, where conscious choice would be minimal.

The collective unconscious and Mind-consciousness communications

Recall that, in Chapter 3, I discussed the concept of a communications path being established between Mind and consciousness. At first, for the animal concerned, the activation of this communications path would have been wholly at the unconscious level. I want to argue now that the enabling of this pathway was the very basis of what Jung called the Collective Unconscious.

At this point I need to introduce Jung's notion of the *collective unconscious* and the *archetype*, and somewhat extend their use to suit my model. The idea of a collective unconscious predated Jung, where Freud talked of archaic remnants. Likewise, the term *archetype* (which appeared with Plato) evolved out of the earlier idea of primordial images. The empirical basis for both the collective unconscious and archetypes was the analysis by Jung of a very large number of dreams (his own, and those of his patients). Jung thought of the collective unconscious as the *objective psyche*, in that it is impersonal and independent of the ego. Jung regarded the collective unconscious as the source of archetypes. In fact, he

went as far as to say that the collective unconscious was the only archetype, but having different aspects. By this, I do not understand Jung to be breaking the rules of logic. He is saying that what he later called the archetypes are really different aspects of the one thing -- the collective unconscious. Further, he regarded the collective unconscious as the source of all instincts and instinctual behaviour.

The archetype was, for Jung, a mode of perception or a predisposition to an image. Archetypes are inherited tendencies of the mind, which lead to the formation of representations of mythological motifs. They are often culture-specific (eg, the *hero* archetype as in the Medieval Knight). Archetypes are bipolar in that they have a constructive and destructive dimension. By this Jung means that they have both good and evil aspects, or in more modern terms, life-affirming and life-denying aspects. For example, the *Mother* archetype is usually thought to be constructive or good, in that it characterises all that is nurturing and life-affirming. However, it has a suppressive, smothering and overwhelming aspect at the polar extreme.

Jung argued that archetypes are *a priori*, and arrange psychic elements into certain images where these may be geometric figures (eg, the mandala), natural forms (eg, the lion), personifications (eg, the hero) and alchemical processes (eg, the process that leads to individuation, where the metaphor is that of turning a base metal into gold).

However, Jung's theories applied only to humans. He never intended them to apply to subhuman hominids, and certainly could not have obtained empirical dream data for this purpose. Nonetheless, because the collective unconscious is an amalgam of the entire racial past of the human species, it seems unreasonable to restrict the collective unconscious to that part which is strictly *Homo sapiens sapiens*. I argue that the collective unconscious goes back far before the appearance of Cro-Magnon or Neanderthals, and in fact goes back to the origins of *Homo* in the earliest hominids. In my model, with the first appearance of the hominid form, as distinct from the pongidae strand, that which characterises *Homo* was built up as a

vast pattern due to the interaction between Mind and consciousness. It is this pattern that we have inherited, and which Jung called the collective unconscious. It is far more than a racial memory (as some have termed it). It is more even than a species memory, because it crosses all those species that lie between the earliest hominids (perhaps *A. afarensis* of some 3 million BP) to present day humans. It is this we share with them, in an ongoing and dynamic way which links us with our far past in a manner which most would not consider possible.

At the stage of the earliest hominids, the other components that Jung so well described (eg, the personal unconscious and conscious) were not operable, because consciousness as we know it had not appeared. There was only this vast collective communications pathway, linking an entire species back to the implicate order, whose effect was subtle and quite hidden from a given animal of that species. However, though hidden, this link had its effect in a given animal in terms of underlying motivations. By this, I mean that the animal's waking activities would have been governed by subconscious urges. It would not have had access to the source of these urges, but would have responded to them nonetheless. In time, with a further increase in brain complexity, hence an increase in the animal's power to recreate images of the day's events, the pathway to the implicate order would have widened, and led to what we call dream activity. In this way, aspects of Mind could be communicated directly to the animal's brain. Initially, via dreams, but later during waking states, the implicate order became able to influence a given animal's behaviour.

Using Jung's notions, I argue that each living animal that made up a species was linked (by means of the communications pathway above) in a subtle and powerful way, such that a *collective unconscious* was formed. Note that I am not invoking any telepathic linkage here. Rather, I am saying that, via each animal's individual linkage with Mind (as part of the implicate order), each animal was linked to every other animal in that species because everything enfolded within the implicate order is enfolded in everything else. This collective unconscious became the inheritance of all the living animals in that given species. Jung's notion of the archetype is relevant here, in that each species would, over many generations,

create an archetypal form of itself. The basis of this form (idea if you wish) pre-existed within Mind, and was fleshed out as it were as the species evolved.

Consciousness of the early hominids

Having set the scene in the preceding two sections, we can now look at ways in which my model takes account of some of the facts given in those sections.

By the time the primate brain emerged, the pathway between consciousness (as a high order explicate) and Mind (as implicate) would have reached a high degree of sophistication, enabling complex notions to be implanted in the animal's brain (via consciousness). At this stage, I stress that what I am describing here is not a communication in the sense of a verbal command or instruction. That came later with early humans, as I will describe later. This could not happen in an early hominid's brain, because there was no speech capacity at that stage of evolution. Rather, I am describing a means whereby the implicate order is able to unfold certain aspects of itself in a very direct way which, at the level of the animal's brain, appear as impulses to act in a certain way.

The palaeontological evidence shows that a major evolutionary change occurred around the time that the primate strand split into pongidae and hominidae, where the latter (hominids) acquired a more human-like form. In particular, it is the increase in brain size that gives the most obvious clue to the evolution of consciousness. As stated earlier, at the beginning of the pongidae (great ape) and hominid fork, the brain size was small. For example, the brain size of *Australopithecus* (which appeared very early along the hominid line) was around 450 cm³, compared with *Homo erectus* who had a brain size of some 950 cm³. I argue that this is a major factor because, in my model, there is a close relationship between the evolution of the brain and that of the unfolding of consciousness (as an explicate of Mind). While we do not have finds of fossilised brains, there seems to be a clear relationship between brain size and its anatomical complexity, which Jerison (1973) refers to as encephalisation.

I explain the process of encephalisation in terms of the explication of that enfolded within the implicate order. Initially, as explored in Chapter 3, prior to the appearance of the primate, the degree of consciousness involved was minimal, and encephalisation was due almost entirely to the more or less automatic process of explication. However, with the beginnings of the explication of consciousness (perhaps, at the appearance of the amphibians, as suggested in Chapter 3), consciousness itself began to play a role in the further process of encephalisation or increase in brain complexity.

A key to this increase in encephalisation is the communications path established between Mind and its explicate (consciousness), as discussed above. In Chapter 3, I used the concept of bandwidth as an analogy for the effectiveness of this path. At the very first explications of consciousness, the bandwidth of the communications path would have been minimal, and consciousness would have existed in an embryonic form. With the appearance of the earliest of the primates, the bandwidth would have increased to such an extent that it facilitated a flow of information from Mind (as implicate) to consciousness (as an explicate that uses the brain to function through).

In the ancestor of, say, a tree shrew, this information would not been available at the conscious level, but would have influenced the animal's behaviour nonetheless. Conversely, in the chimpanzee's ancestor, the bandwidth of the communications path would have increased dramatically, and would have produced an effect at least at the dream level. For example, a given chimpanzee might have had a dream about twigs, in relation to termite mounds which, in waking consciousness, emerged as experimenting with a twig and learning how to *fish* for termites in a mound.

With the appearance of true hominids, the communications pathway between consciousness and Mind would have shifted into a new and higher mode of operation. It seems that these early hominids did not possess speech, because they lacked any equivalent to human speech centres (Jerison, 1973). It is not clear whether hominids as recent as *Homo*

neanderthalensis had speech (see the discussion in the preceding section), so it seems safe enough to assume that the earliest hominids of some 2 to 3 million BP did not possess speech. Thus, initially, the form of communications that took place along this communications path were as for the non-human primates (ie, non verbal). However, the hominids had a more complex brain (as judged by cranial capacity) which, in my model, implies a greater degree of conscious awareness. Thus, I argue that these early hominids would have been capable of receiving far more complex communications. Dreaming would have become more subtle, and waking communications would have also occurred in the form of powerful images. It is likely that these early hominids would not have readily distinguished between sensory reality and their internal states of consciousness, in that (coupled with a lack of speech) they were utilising only the Piagetian pre-operational stage (Wynn, 1989). Recall that Wynn argues that concrete operations did not appear until about 300 000 BP, long after the appearance of the first hominids (some 2 or 3 millions years previously).

However, although it is very difficult for us to imagine what the daily life of these early hominids might have been like, we can make some speculations. Assuming that they were at the pre-operational stage, but also lacked speech, they would have been reliant on imagery in a way that we modern humans never are as adults. Also, they would have lived in the *here and now*, having little conception of a past or a future. There would have been an immediacy to all sense data, and an absence of conceptualisations based on these data. Visual and auditory sense data would have lived on in the mind's eye and ear in an eidetic fashion, and would have influenced the ongoing real-time perception of the world. By this I mean that there would have been a fusing of images formed in the brain as a result of sense data being received at that moment, and the visions-auditions resulting from eidetic recall of moments already in the past. These would have merged to represent the real world. In this way, these early people would not have made the sharp distinction that we moderns do between dreaming or hypnogogic states, and waking consciousness. This has interesting parallels with the Australian Aboriginal's description of their own far past, which they call the *Dream Time*. One could speculate that they are referring to something like the state I am describing here.

Intertwined with this waking-dream state, there would have been the information coming down the communications path from the implicate order, especially those audio-visual representations which we now call archetypes. These archetypal impressions would have had a powerful influence on the behaviour of these early hominids, and enabled the implicate order to guide this behaviour. This guidance parallels at the consciousness phase, that which occurred at a far earlier time when the implicate order was explicating biological forms. But at this turn of the spiral, it is behaviour and cultural dimensions that are being constructed rather than biological forms.

What originated as powerful imagery in these early hominids, slowly evolved into a process whereby images could be recovered (and brought to life on a cave wall), then later codified in some way for more effective storage and subsequent retrieval. No doubt, this initial form of codification could not be described in terms of creating abstract mental symbols, but was certainly the precursor to it. Over generations, in parallel with the unfolding of this image codifying process, changes would have been occurring in the brain. This would have taken place by a combination of the older process of *shapes* getting back into the implicate order (at the death of each animal), and the much newer process of the direct link with Mind, via the communications path. In this way, new neural structures would have been unfolded, where some of these would have been the embryonic basis of what would eventually become speech areas in the motor cortex.

With the development of embryonic speech areas, the bandwidth of the communications channel between Mind and a given animal was dramatically increased. This enabled more complex and subtle communications to occur, and the idea of speech could be conveyed over many generations. At this point, I wish to stress that when I use words such as conveyed, I am not implying a someone (eg, a God) doing the conveying. I refer only to the process whereby what lies implicated within Mind unfolds into its explicated consciousness. In the same way that the extent to which the lesser (lower) region of the implicate order could unfold depended on what had already been unfolded, further explications of Mind depend on what

has already been explicated as consciousness. The higher the quality of consciousness, the more subtle is that which can be unfolded within it from Mind (as part of the implicate order).

In the context of the transition from pre-speech communications to speech, Jerison (1973) says that emotional calls of non-human animals, as opposed to speech proper, are controlled from the limbic system. This is quite different to the case of speech, which is controlled from the cortex. That is, in the human cortex, we have Broca's and Wernicke's areas. The former controls speech production and the rules of grammar or syntax, and the latter controls speech comprehension and access to lexical memory or semantics. In the emotional type of call (there are some 15 to 20 types in apes) there is no variability. The emotional message speaks for itself and the message can never refer to something that is not here and now. There is no seeming connection between the evolution of emotional calls and that of the speech centres. The former can be stimulated neurally whereas the later cannot. The commonality between the two lies only in sharing the same sound-producing organs.

Note at this point that I am implying two forms of the explication of Mind. Firstly, Mind explicates itself as consciousness per se in the sense of consciousness as an entity. As this explication continues, this entity, that I call consciousness, evolves. Secondly, in the process I am describing as communications between Mind and consciousness, there is another form of explication taking place. That is, while the entity itself is being refined, informational patterns are imparted within it. Using a simple computer analogy, the first mode is dealing with the development and refining of, say, a disc operating system (DOS) of software, whereas the second mode deals with the application packages which the DOS manages. These two modes of explication of Mind are different, and clearly the former mode came into being first. But they are inextricably interlinked, and become more so as consciousness evolves.

The consciousness of neanderthalensis

As shown in the first section, where I discuss the palaeoanthropological evidence, it is not clear whether *Homo neanderthalensis* is a separate species or a geological variant of *Homo*

sapiens. However, most modern texts (eg, Zubrow, 1991) regard the Neanderthal and Cro-Magnon as subspecies of *Homo sapiens*, and distinguish between them by classing them respectively as *Homo sapiens neanderthalensis* (Hsn) and *Homo sapiens sapiens* (Hss). However, despite their being subspecies of a common ancestor, there is evidence that there were certain differences between Hsn and Hss, especially in regard to social life and tool-use (Foley, 1991). The two belong to two different periods of the tool-making era, where Hsn belongs to Lower Palaeolithic and Hss to Upper Palaeolithic. This is a major distinction because, as Wynn (1989) argues, it is in the Upper Palaeolithic that we first see evidence of concrete operations. That is, it seems unlikely that Hsn could use this mode of thought, and was thus using only the pre-operational mode.

Anatomically, it seems that there were few major differences between these two subspecies of primate. The major differences would have been in terms of brain structure. In particular, Hsn would have lacked the speech centres we possess in our cerebral cortex, and even lacked the appropriate vocal tract (see the earlier discussion). The implication is that there seems to have been a large difference between the two in terms of consciousness. I speculate that this was due to some threshold being crossed in terms of the explication of neural structures, which in turn led (rapidly) to the unfolding of more advanced aspects of Mind.

This type of event highlights what I believe are two different rates of the unfolding process. There is the regular and steady rate (more linear in terms of time) whereby Mind progressively explicates itself as an entity I call consciousness, which utilises the biological structure we call the brain. But, at intervals along this more or less linear process of unfolding, there would have occurred discontinuities or jumps, where the unfolding of a certain brain structure, led rapidly to the explication of further aspects of Mind, which in turn fed back into the further rapid refinement of the new brain structure and so on, until the jump was complete. I talk of a jump, and use the word rapid, but these are relative terms. If one plotted the more

linear process over a large enough time scale, the events I am talking of would appear like jumps in the linear curve up to some new level of operation.

No doubt, over the entire span of the evolution of consciousness (from amphibians to this time), there have been many such jumps in the curve, each taking it up to a new level. Some jumps would have been more significant than others. Some might only have involved the unfolding of some minor capacity of consciousness (eg, an extension in medium term memory), whereas other would have involved a major shift in consciousness (eg, from pure imagery to the ability to codify images for subsequent retrieval). The jump I am considering here, that brought forth first Neanderthalensis then Cro-Magnon, has been the most significant jump in the course of the evolution of consciousness, and arguably the most significant in the entire course of evolution on this planet.

In terms of brain structure, this jump seems to have brought forth (or perhaps taken to a new level of complexity) Broca's and Wernicke's areas, and so provided the neurological means of speech reproduction and comprehension. There is some evidence that Broca's area existed in embryonic form as early as *Australopithecus afarensis* (Johanson's Lucy). However, in the absence of a corresponding Wernicke's area (essential to speech comprehension) it seems unlikely that speech was in use as far back as *A. afarensis*. In fact, as discussed earlier, it seems that even *Hs* lacked the appropriate vocal anatomy to produce certain essential vowel sounds, even though they might well have had the basic neural equipment. At this stage of evolution, prior to the acquisition of speech, skills were passed on from one generation to another, and so a form of teaching could be said to exist. However, this would have occurred in a non-verbal fashion, wherein observational learning would have played a key role.

The consciousness of *Homo sapiens sapiens*

In physiological terms, the jump I have been discussing must also have produced changes to the vocal tract, such that certain essential sounds and utterances could be made. In

cognitive terms, there seems to have been shift from a pre-operational mode to one of concrete operations, and later still, to formal operations (Wynn, 1989). There were also changes in life style and social structure, such as in the focus on certain game niches (eg, gregarious herds), the exploitation of fish resources and trading with shells (Wynn, 1989). That is, I speculate that all this must have entailed a massive and very rapid change in brain structure, hence the unfolding of Mind (as consciousness).

But, more than producing speech and certain changes in psycho-social life, this jump appears to have involved the ability to produce mental abstractions and an advanced ability to generalise from the particular instances to concepts. This, again, is supported by the work of Jerison (1973) and Wynn (1989), where the latter argues that Cro-Magnon (as opposed to Hsn) acquired formal operations. This shift would have entailed a marked difference in the mode of thought. It is only at the stage of formal operations that true abstract thinking emerges where thought is liberated from the tyranny of the concrete. Also, time comes into thinking in the sense that a person at the formal operations stage can think in terms not only of what has been, and what is happening, but also of what might happen. In particular, problems of a purely hypothetical nature can be formulated and solved. This was not possible at the earlier stage of concrete operations.

Wynn uses evidence of long-range planning to support his view that Hss (eg, Cro-Magnon) possessed formal operational thinking where Hsn (neanderthal) did not. He sees evidence of such planning in the curation of tools, the planning of a hunting trip, the exchanging of information with other groups, the exploitation of fishing resources, and specialisation in the hunting of certain game to the exclusion of other game. Note, at this point, that these activities in themselves have not fossilised. An inference is made from the evidence found at campsites, such as those at Olduvai mentioned earlier. As most, if not all, of these activities were absent in the Hsn, it seems reasonable to conclude that neanderthals were, at best, using only concrete operational thinking. But, regardless of the exact nature of this leap in

consciousness, its effects were dramatic, in that with the appearance of Cro-Magnon, the Neanderthal people were doomed (Zubrow, 1991).

I do not believe that what was Neanderthalensis slowly changed into us (Cro-Magnon). In fact, in the view of modern scholars (eg, Zubrow, 1991) Hss and Hsn are regarded as subspecies of some parent stock. This being the case, I offer the view that the forking which occurred (leading to Hss and Hsn) was due to the type of jump that I have described above. That is, entirely new genetic material appeared as a result of this jump. This, in turn, led from the common ancestor into what we now call *Homo sapiens sapiens*, of which Cro-Magnon is an exemplar. It also clearly left one strand to continue, which became *Homo neanderthalensis sapiens*. While changes must certainly have occurred in the ancestral stock for a subspecies Hsn to arise, I speculate that these changes were not as fundamental as those occurring in what eventually became Hss.

Perhaps the initial difference between the two subspecies (at the point of forking) was not great, but was enough in what became Hss to lead to the most recent jump I describe. That is, the original Hss parents had certain qualities that facilitated this most recent jump in consciousness I have described, whereas the original parents of Hsn lacked these qualities. No doubt, at their first appearances, there was no dominance in numbers of Hss over Hsn, nor probably was there a marked behavioural difference between the two subspecies. But I argue that the underlying changes in brain and consciousness occurred in a matter of generations, and not over millenia. Zubrow (1991), shows that the only way that neanderthals could have survived was if Hss had had extremely low population growth rates, such was the difference between the two subspecies. As it turned out, even though the Cro-Magnon population was far outnumbered by Hsn when the two subspecies started to interact in Northern Europe, within 100 generations (say, 2500 years), Hsn was already on the decline, and by 200 generations (say, 5000 years) Hsn was virtually extinct. This fact can only be explained in terms of the superior survival skills of Hss, and in particular in terms of their superior intelligence.

With the emergence of the capacity for speech, the interaction between consciousness and Mind became very complex, and the communications channel referred to earlier widened enormously, allowing ever more sophisticated aspects of Mind to influence the waking processes and leading to the development of external speech forms. These would have been primitive and ill-formed at first, and would have been pragmatic in their application, dealing with the rather primitive conditions under which Cro-Magnon appeared and lived. But, in time, the potential for more sophisticated abstractions would have been facilitated, and these capacities would have begun to influence external behaviour. For example, even the crudest forms of external speech would have increased the effectiveness of communications between the members of the species. This would have been a crucial step in a peoples who depended for their existence on hunting and gathering. Compare this with my speculations above about how it might have been for the early hominids, whose hunting trips could not have been planned, but were the result of spontaneous activities arising out of their particular state of consciousness. The activities of a Hss hunting party would have moved up to a new level of coordination and effectiveness with the introduction of speech. But, more than this, members of the hunting party, on return to their habitation, would have been able to review the day's events, either privately in their own thoughts or collectively and publically. Also, those who had not taken part in that particular hunt would have been able to share in the events.

At this point in the evolution of consciousness, the relationship between the explicated environment, the brain as a physical explicate, consciousness as an explicate of Mind, and Mind itself as part of the implicate order, becomes very complex and convoluted and extremely difficult to describe. We now have a primate that can directly and deliberately influence and change its environment (slight by our standards, but there nonetheless). It also has a very sophisticated (though still largely unconscious) direct link with the implicate order (as Mind). Its brain is the prototype of the modern human brain (in fact, there is probably little real difference between our brains and that of the earliest of Cro-Magnon). There is arising a culture that is based on the ability to speak and not simply on non-verbal communication

patterns as with Neanderthalensis. There would have arisen a tradition that could be kept alive in a way that the earlier cave paintings could never bring about.

The changes that would have started to come about in the external life of these people would have brought about a qualitative change in the *shapes* being reabsorbed into the implicate order, which would have facilitated a refinement of the general anatomical and neural structures. Also, the more purely mental activities such as speech and primitive concept formation would have directly influenced Mind, via the communications channel, thus releasing a new wave of ideas, bringing about improvements in speech structures and abstract thinking. But this had to interlink with the parallel unfolding of new or improved neural structures in a complex fashion, and was also bound up with the external changes taking place in the social structure of these people.

For example, hunting techniques would have been developed and communicated from experienced to less experienced members. Thus there emerged the overt role of teacher, as opposed to what we might regard as covert teachers in earlier hominids. At the stage being considered here (that of early Hss), speech came in as a powerful factor in the passing on of skills, as it still is today (where the printed word is a form of frozen speech). There would also have occurred the primordial beginnings of division of labour as a more conscious (rather than natural) phenomenon. Along with these more practical matters, stories, myths and legends would have appeared and passed on from one generation to the next. Thus, an entire socio-cultural structure would have emerged, which could well have differed from one tribal grouping to another.

It is my argument that, what we see as a socio-cultural structure, is a reflection of that which lies enfolded within Mind as a part of the implicate order. In the same way that I speculated on the unfolding of tangible physical structures (atomic, chemical and biological) in Chapter 3, I now argue that a parallel exists with the unfolding of that region of the implicate order I call Mind. This unfolding could only have begun once certain physical structures were in place.

Among these a suitable anatomy (flesh, bones and brains) was a prerequisite. With appropriate neural structures in place, the communication channel between consciousness and Mind increased in bandwidth until sophisticated ideas could be communicated to the evolving consciousness. At first, these would have been either in the form of dreams, and waking urges to some sort of action. Later, with the development of speech, these communications could have taken the form of voices in dreams, and later still in voices heard during waking states (as argued by Jaynes, 1976 -- see the discussion on this theorist's work in Chapter 4) .

As I explained in Chapter 4, I agree with the essence of Jaynes' (1976) basic thesis, but I disagree with his timescale, because I cannot accept that the voices he talks of occurred so recently in the history of human kind. I believe that the bicameral phase that he talks of occurred much earlier than the time of Homer of the ancient Greek world. It makes sense to me that it appeared with the appearance of human speech. That is, with Cro-Magnon, where it seems the capacity for speech first emerged. However, despite the disagreement over timescale and the problems I discussed with the left-right brain issue, I accept that there was a phenomenon such as Jaynes describes, and see it as a necessary part of the process that I have referred to as influences coming via the communications channel (from Mind to consciousness).

If we go back to the computer analogies I used in Chapter 3, this earliest of true humans can be analogised by the AI CAI system that has a fair degree of autonomy and local intelligence, but not that commensurate with the fully interactive AI-CAI system I described, where graduate students can modify the software. That is, in these early humans, their new found autonomy would not have been quite ready for assuming full control of their destiny, and would have needed some guidance. By this I mean that the degree of consciousness evolved at that early point was not enough to be able to competently direct the life of the individual without some input from Mind.

Thus, I believe that, in addition to the non-waking modes of influence, guidance came in the form of voices heard in the brain in waking states. But, I use the word guidance guardedly. I do not use it in the way Jaynes uses the word commands, because the way Jaynes uses it carries with it the notion of divine commands coming from some god or other divine being. I accept that these voices would have been perceived by these early people as commands issuing from another. At their stage of evolution, they could not have reasoned that these voices were the product of their own brains interpreting that which was received in consciousness from Mind. It is not at all that Mind "spoke" to the brain. Rather, it is that what was communicated from Mind to consciousness could only take the form of a voice in the brain of the recipient. It would be a misunderstanding of what I am saying about these modes of communication from Mind to see them as instructions or commands. They, like all of the other unfoldings, are explications of the implicate order. However, at the stage we are now considering, it is speech more than any other behavioural aspect that best characterises human consciousness. This stage of heard voices was needed only while the consciousness of Cro-Magnon was evolving to the point where it could assume full autonomy and control over the behaviour of the individual.

THE EVOLUTION OF CONSCIOUSNESS: WHERE TO NEXT?

Only in modern humans do we see consciousness having evolved to such a degree that it is fully autonomous, and does not need direct guidance from Mind. But this is not to say that the communications channel has ceased to function in us. It has not atrophied, but is not used as much as earlier peoples used it. This, I argue, is a price (temporary) we have had to pay for acquiring such a high degree of conscious autonomy. It is as though, using the AI CAI computer analogy, the student users have become so involved in the exercise of their local autonomy as to forget to utilise the full potential of the system's software. In most modern humans, the interaction is now between consciousness (as Mind's explicate) and the brain. The focus is outward and sense-conditioned. Consciousness-brain has become a highly autonomous unit, with all of the capabilities needed for survival in this modern world.

However, in entering this particular (and unique) phase of the evolution of consciousness, we pay the price and suffer an existential loneliness.

The route to sanity is getting back into touch with the implicate order. But we tend not to notice the primacy of the implicate order because we have become (at least as adults) habituated to the explicate order. That is, we continually emphasise and reinforce the explicate order in thought and speech, such that we tend to strongly feel that our primary experience is that which is explicate and manifest. Also, in the process of activating memories whose content is stable, recurrent and separable, we focus our attention on that which is static and fragmented (the explicate). From this arises the illusion in which the manifest static-fragmented content of consciousness is experienced as the very basis of reality. From this, we seem to obtain proof of the correctness of this mode of thinking and perceiving.

The way each of us thinks of the totality (our world view) actually determines the ordering of our own minds. If we think of reality as constituted of independent fragments, we will think in fragmented ways. Each perception of a new meaning by an individual changes the overall reality in which that person lives. This implies that such a reality can never be complete, but must in fact be an open system. In the mechanistic world view, meaning and reality are sharply separated, and are not seen to interact. Reality is regarded as unchangeable in any direct way by perception of a new meaning. But if meaning itself is a key part of reality, then whenever relationships are seen to mean something new, a fundamental change has already taken place. What an individual does is an inevitable consequence of what the whole experience means to that individual. If people could sustain a perception of the world as an unbroken whole, there could be an unending creative perception of new meanings, which would unfold in a corresponding transformation of the overall reality. The mind that can include everything coherently and harmoniously in an over-all whole that is undivided, unbroken and without a border, will tend to move in a similar way and from this will flow a synchronistic orderly action within the whole.

There are clearly difficulties in establishing and maintaining such a world view. However, a beginning is made when we reach a degree of frustration with the fragmented view because, although it is seen to work up to a point, we come to realise that nature consists of an unbroken wholeness: a ceaselessly interpenetrating flux of all events and entities. Thus, ultimately, our compartmentalised thinking breaks down, and with it comes the realisation that the notion that all these fragments exist independently is an illusion, and that this illusion cannot do other than lead to endless conflict and confusion. In fact, I go so far as to attribute the world's disorders to the attempt to live in accordance with the notion that the fragments really are separate. The reality is that the unbroken wholeness of the cosmos is a flowing stream whose substance is never the same. On the stream one may see an everchanging pattern of vortices, ripples, waves, splashes and so on, which evidently have no independent existence as such. Rather, they are abstracted from the flowing movement, arising and vanishing in the total process.

Thus, I see that the next major step in the evolution of human consciousness is toward a more holistic perception of the world, where this leads to Grof's notion of a higher sanity. This will eventually lead to such a degree of integration at the individual level that a global integration becomes (for the first time) a real possibility. In the next and final chapter, I will look this possibility.

The basic aim of this Chapter was to consider what the evolution of consciousness might entail, using available palaeoanthropological evidence as the anchor, then show that this concept is explicable in terms of the implicate-explicate model I developed in Chapter 3. I feel that this aim has been met. In the final chapter, I will explore some of the implications of my model and thesis.

CHAPTER 6: THE IMPLICATE-EXPLICATE MODEL: SOME IMPLICATIONS FOR PSYCHOLOGY AND FOR THE FURTHER EVOLUTION OF CONSCIOUSNESS

I believe that there are wide-ranging implications arising out of the implicate-explicate model of the evolution of consciousness I have been developing over the past five chapters. One obvious implication is what my model might suggest as the next step in the evolution of human consciousness. I will address this implication in the final section of this chapter.

My model also has implications for a variety of disciplines, of which psychology is only one. However, since the topic of consciousness rightly belongs within the discipline of psychology, it seems proper to end this thesis with some considerations as to how my model might offer explanation of certain aspects of human behaviour, alternative to other theories in psychology. I am not proposing a new theory, nor am I saying that the current theories of psychology are wrong. Rather, I am suggesting that in a science as new as psychology, there is still plenty of scope for new ideas, especially in those areas of psychology which are least well understood.

THE NOTION OF A PARADIGM

In my view, consciousness lies behind all aspects of psychology. However, from an overview of the sub-disciplines that constitute the science of psychology, it may appear that consciousness is more relevant to some areas of psychology than to others. In order to understand this, I envisage a spectrum of psychological paradigms, arranged according to the relevance of consciousness for any given paradigm. At one end of this spectrum would lay that paradigm that is least concerned with consciousness, and at the other end that paradigm most concerned with consciousness. The remaining paradigms would fall somewhere between these two extremes.

Before proceeding with the placing of the various paradigms along such a spectrum, it is first necessary to identify the major psychological paradigms. But before I do this, it is worth

saying something about the term *paradigm*, so as to make my use of it clear in relation to psychology.

Using Kuhn's (Kuhn, 1962) discussion as a basis, we can say that a paradigm is a set of basic assumptions that delineate a specific subset or branch within the general field of scientific enquiry. It specifies the concepts that are regarded as legitimate and the methods needed to collect and interpret data. Decisions about what constitutes a datum or scientific observation are made within the paradigm. A given paradigm constrains the thinking of those who choose to operate within it such that they are committed to the same rules and standards of scientific practice. The paradigm specifies the type of problems investigated and the methods used in going about their investigation. Thus, the paradigm is supported by a consensus, and tends to be self-reinforcing and, in this sense, is somewhat like a mind-set which excludes other ways of looking at and thinking about the world. Thus, a given psychological paradigm has profound implications for those working under its auspices.

In this most general view of the term paradigm, one might regard psychology in its entirety as a paradigm, it being one branch of science. But I need to obtain a sharper focus than this, and so need to consider the subsets of psychology itself. Note, at this point that, in keeping with the above definition of a paradigm, we would not label given areas of psychology as paradigms. For example, it would not be proper to call social psychology or developmental psychology a paradigm, because many different mind-sets are brought to these fields of enquiry.

THE MAJOR PSYCHOLOGICAL PARADIGMS

I can now delineate what I regard as the key psychological paradigms. In this task, I have been guided by the thoughtful analysis given by Davidson & Neale (1986). While Davidson & Neale's text deals principally with abnormal behaviours, I would argue that this requires so comprehensive a view of psychology that the paradigms they list (with two exceptions which I shall add) cover all the major paradigms used within psychology.

Davidson & Neale (1986, page 27) list the five major psychological paradigms as:

Physiological; Psychoanalytic; Learning; Cognitive and Humanistic. To these I wish to add *Sequential* and *Transpersonal*, where the legitimacy of these additions will emerge as I delineate each paradigm. While I am guided by Davidson & Neale's list I wish to modify the labels given to two of their paradigms, for reasons I shall give below. Thus, my complete list of paradigms reads: *Learning/Behaviourist; Physiological; Sequential; Computational; Psychoanalytic; Humanistic and Transpersonal.* In this, the reader will note that I have replaced learning with learning/behaviourist, and cognitive with computational, and altered the order.

Learning/Behaviourist: This is the paradigm that Davidson & Neale have labelled *Learning*, which I relabel Learning/Behaviourist. I do this because the authors themselves start their section on this paradigm (Davidson & Neale, 1986, page 38) by talking of the *Rise of Behaviorism*. In this, they are recognising the importance of the behaviourist viewpoint (arising as it did out of the operant conditioning model developed by Watson and Skinner). I accept that behaviourism is only one part of what Davidson & Neale call the learning paradigm, but argue that it has so come to dominate, that it deserves a place in the label.

A basic assertion of this paradigm is that, because we cannot know anything of certainty about internal behaviours (eg, thoughts and feelings), the only valid focus for psychology is that of external behaviours. Also, this paradigm subscribes fully to philosophical empiricism. Out of this paradigm have arisen a variety of theoretical structures such as, for example, those of *classical conditioning* and *operant conditioning*.

In general, consciousness has played no part in this paradigm. This is because the focus has been on the inputs (stimuli) to and outputs (responses) from a black box, without any interest in what might go on in the black box. This is the basic S-R model. Thus, the concern has been with the learning of behaviours, where a stimulus and the response it elicits has far

outranked the organism in importance. This is as true for classical conditioning as it is in the more recent operant conditioning model and its derivatives. This is not to say that consciousness has been totally ignored. Skinner needs to be given credit for facing up to the issue of consciousness, and he deals with it in his *Beyond Freedom and Dignity* (Skinner, 1972). However, he appears to give little credence to the notion of a mentalistic being that guides external behaviours. In fact, he denies the existence of any such autonomous entity and offers instead a unique bundle of behaviours determined solely by the environment. Paradoxically, Skinner exhorts us to take control of our evolution by *consciously* designing our entire culture so that it will shape the behaviour needed in our survival.

There is a strong emphasis on a certain type of learning in this paradigm (ie, learning as making S-R connections), which accounts for Davidson & Neale's own label. There is a playing down of genetic or other internal influencers of behaviour. There is also an emphasis on the individual as opposed to the group, hence the popularity of single case studies and an aversion for normative statistical approaches involving comparing individuals with group norms.

Physiological: Davidson & Neale point out that this paradigm has sometimes been called the *medical model*, in that it views behaviour disorders as an illness or disease. They prefer their broader term for several reasons, but mainly because things medical reduce to things physiological. I prefer their label because it can encompass all forms of human activity, and not simply those which society classifies as abnormal. This paradigm views behaviour in terms of biological and physiological structures. It is especially concerned with the neurological structures, and views these as lying at the root of all behaviour. It does not reject the fact that certain behaviours are learned, but the emphasis is on internal organic structures, electro-chemical mechanisms and genetic determinants. Some major aspects of this paradigm include neuropsychology and psychophysics. This paradigm is probably the closest that psychology gets to modelling the hard sciences, such as physics, chemistry and biology.

Sequential: As explained above, Davidson & Neale do not list such a paradigm. However, I would argue that there is mind-set within psychology that views human behaviour in terms of sequential stages of development. This mind-set contrasts strongly with the Learning/Behaviourist mind-set, which opposes the notion of stages of unfolding according to some predetermined plan. Also in this paradigm, unlike that in the Learning/Behaviourist paradigm, there is a concern with what goes on within the black box. One might call this a developmental paradigm, but this would cause confusion with developmental psychology, which is a sub-discipline rather than a paradigm. Another label might be *stagism*, but I have settled for *Sequential* because this best describes the focus of this paradigm.

The main thrust of this paradigm is the belief that life forms in general, and humans in particular, pass through various distinct and identifiable stages of maturation, growth and development across their lifespans, where these stages occur in a certain irreversible time order. These stages are the result of the actions of internally controlled maturational mechanisms and the interaction of these with the environment of the organism in question. Thus, there is a strong focus on genetic mechanisms and on epigenetic ground plans, and also a recognition that the setting plays a role. That is, there is a genetic ground plan which unfolds within some context permitting variations to occur, and learning to take place. In this way, genotype gives rise to phenotype. Within this paradigm, physical, emotional, mental and social aspects of development are considered, which shows that there is a recognition of things mental, and hence some recognition of consciousness.

Computational: This is the paradigm that Davidson & Neale label *cognitive*. However, this can cause confusion with cognitive psychology which encompasses a much wider range of ideas, such as set, schema, memory, encoding processes, attribution and so on. I prefer the term *Computational*, because it makes it clear that what defines this paradigm is its use of the digital computer model as the key to understanding certain human behaviours. In particular, this paradigm deals with the ways in which we represent reality to ourselves, and explains this

in terms of a digitally based information processing model. While the key to this view is the computer model, this paradigm draws on disciplines outside of psychology, such philosophy, neuroscience, artificial intelligence and linguistics. There is little interest in the affects, nor in context, culture and history. However, it does not reject the notion of consciousness or mind, and is vitally interested in the mind-body problem.

Psychoanalytic: While I use the same label as Davidson & Neale for this paradigm, I have broadened its compass to include both Freud and Jung, and their neo counterparts. Davidson & Neale exclude Jung, because their text deals with abnormal psychology, where Jung's theories go well outside this ambit.

This paradigm arose out of the work of Freud, who divided the mind or psyche into three basic components: *id*, *ego* and *superego*, which are psychic structures. However, the emphasis in this paradigm is not on structures but on processes. In particular, the focus is on an energy system which forms a closed conservative system, which obeys a parallel to the energy flows in such as mechanical or hydraulic systems where energy is conserved. Certain psychic principles are believed to be at work, such as the hedonic principle which causes an organism to seek pleasure or at least avoid pain. Its origin has led this paradigm to having a major focus on behaviour disorders and on psychopathology, and on explanations for these and ways of correcting them.

It is interesting to note that Freud entertained sequential notions and developed a definite stage concept, as shown in his oral and anal stages. However, in my opinion, this would not place his theory within the Sequential paradigm because, as stated above, Freud's view of an energy system is unique and is a mind-set of its own. It is also of interest to note that in the context of my implicate-explicate model, we would not say that Freud was overly concerned with Mind as that which leads humans through Freud's various stages. Rather, Freud posited primitive processes as doing this work.

Jung does not appear to have followed this stage-like thinking. Rather, he saw a general movement or progression of the human psyche toward individuation. This contrasts strongly with the fairly primitive dynamics that Freud saw as driving us through his stages. With Jung, it is more a pull from something big (perhaps Mind, as in my I-E model). While Jung was still concerned with psychic processes (hence belongs within this paradigm), he took this paradigm into a new dimension with his concern for the whole psyche, and not simply with those parts that can produce disordered behaviours. Jung's great contribution was to introduce psychic processes which could lead to a movement from psychopathology, to normalcy and beyond to a high level of functioning that he regarded as the outcome of full individuation. Thus, this extension to the paradigm takes into account the more positive and growthful dimensions of the human psyche.

Both Freud and Jung (and their followers) gave credence to the notion of consciousness, but it is Jung's contribution that has extended this paradigm to giving a fuller recognition to consciousness, and the role that it plays in the development and evolution of human kind.

Humanistic psychology: This paradigm arose out of a dissatisfaction with the basic pessimism of Freud's view, and the reductionism of behaviourism. It regarded itself as a *Third Force* in psychology, which could offer a way forward to taking into account the entire person, and in particular the process called self-actualisation. It spurred what became known as the human potentials and growth movements, and gave rise to a wide variety of theories of human nature, its evolution and techniques for bringing about wholeness. In this paradigm, consciousness plays a key role both as that which characterises what it is to be human, and as that within humans that has the potential to grow. It gives full recognition to the other paradigms within psychology, and sees that each has its place and specific explanatory power. However, it does not see any one of these paradigms (basically those listed above) as being able to explain all of human nature and behaviour.

Transpersonal psychology: This paradigm arose out of a dissatisfaction with humanistic psychology which, although regarded as wide enough to encompass much of human behaviour, was found wanting when it came to the more truly transcendent dimensions of mind and consciousness. This paradigm would hold (more so than any other paradigm) that psychology is primarily the science of consciousness. However, while it is concerned with manifestations of consciousness in all its aspects of internal and external human activities, it is particularly concerned with transcendent behaviour, where the ordinary waking self is seen to be just one facet of a much wider and greater whole. It recognises the spiritual dimension of human nature as a realm on which psychology has something valid to say, and sees this realm as being the ground of human consciousness. It also recognises the valuable part played by the literature of those religious and mystical traditions which see Mind (hence consciousness) as that which lies back of all that is.

THE SPECTRUM OF PARADIGMS

Earlier, I suggested that these paradigms can be placed along a spectrum of the relevance of consciousness to a given paradigm where, at one end of this spectrum consciousness has little or no relevance at all to the paradigm located there, while at the other end consciousness has great relevance. For this spectrum to have validity, I need to securely anchor the two ends, even if there remains some dispute as to the exact placing of the intervening paradigms.

At one end of this spectrum I would place the Learning/Behaviourist paradigm, where consciousness has little or no relevance because the very notion is superfluous to the paradigm, which relies basically on stimulus and response. While the presence of an organism is recognised, for the most part, what goes on within this organism is of little interest.

At the other end of this spectrum I would place the Transpersonal paradigm, because this deals with that which lies beyond the personal self, and so deals with consciousness as that essence which lies back of all other modes of mentation.

Between the two ends of this spectrum lie the remaining five major psychological paradigms listed above. Starting from the no-relevance end of my spectrum, and moving towards the full relevance end, I tentatively order these paradigms as: *Physiological*; *Sequential*; *Computational*; *Psychoanalytic*; and *Humanistic*. I say tentative in respect to these placings along this spectrum because, while I am certain about the paradigms I have chosen to anchor the two ends of my spectrum, the exact placing of the other paradigms will not be clear until I have further explored this notion of the relevance of consciousness. For example, although I have placed the Physiological paradigm near to that end where consciousness has little relevance, consciousness is clearly a factor in, for example, psychophysics, where something has to detect a **just noticeable difference** (jnd). However, in this respect, there is a need to distinguish between awareness, attention and consciousness, where the jnd is more to do with attention than consciousness. On the other hand, consciousness may be most relevant to those paradigms where the behaviour is complex, poorly understood and involves the whole person as, for example, in the Humanistic paradigm.

In considering this spectrum of paradigms, I would like to view it in the light of my implicate-explicate model of consciousness. In particular I wish to explore the possibility of a relationship between the implicate and explicate realms, and the positioning of the various paradigms along this spectrum. To do this, I need to establish a link between the relevancy spectrum and the implicate-explicate model. I cannot simply map the relevancy spectrum onto the implicate-explicate dimension for two basic reasons. Firstly, the I-E dimension is not really a spectrum. That is, the implicate is not some polar extreme and the explicate another. Rather, the explicate derives from the implicate. Secondly, the paradigms in psychology make no use themselves of the implicate-explicate categories, and so are not I-E paradigms.

However, there is a spectrum of explication, and along this spectrum can be placed degrees of consciousness as it unfolds as an explicate of Mind. This spectrum can be mapped onto the relevancy spectrum, because both deal with consciousness. Thus, although there is no numerical or one-to-one correspondence between the relevancy and explicate spectra, I can show them as common horizontal axes. This is shown in figure 6.1.

Figure 6.1 shows two horizontal axes. The upper of the two is the relevance of consciousness spectrum discussed earlier. This ranges from no relevance to high-relevance. It must be understood that this axis does not represent some numerical interval scale. Rather, it is to be seen in a more qualitative way, where placings along it indicate a ranking order. The lower spectrum shows the degree of explication of the implicate order. At the far left, we have pure matter, which is the lowest possible degree of unfolding of the implicate order. In terms of the model I have developed in Chapter 3, consciousness does not appear along this spectrum until a certain stage of explication has been reached. This point is shown by the vertical line (labelled as embryonic). To the right of this point (where the shaded zone begins), it is legitimate to show the degree of consciousness, as it moves from its most embryonic stage to its present stage in humans (labelled as present, meaning that stage reached by present-day humans), and beyond to what it might become. As argued above, pure Mind is not to be seen as some aiming point of consciousness. Therefore, Mind does not come into this spectrum. Consciousness ever remains an explicate, even though of a very high order, and so pure Mind is not the highest level of consciousness imaginable, but is the source of that consciousness whatever its stage.

I have placed each paradigm along the relevance spectrum, according to the order developed above. Thus, we have the Learning/Behaviourist paradigm close to the no-relevance end and the Transpersonal paradigm at the high-relevance end, with the remaining paradigms ranked between. In this way, we can see how each paradigm relates to the explication of consciousness. Note, as argued above, there is no one-to-one correspondence between the two horizontal axes because both are qualitative and not numerical scales. Thus,

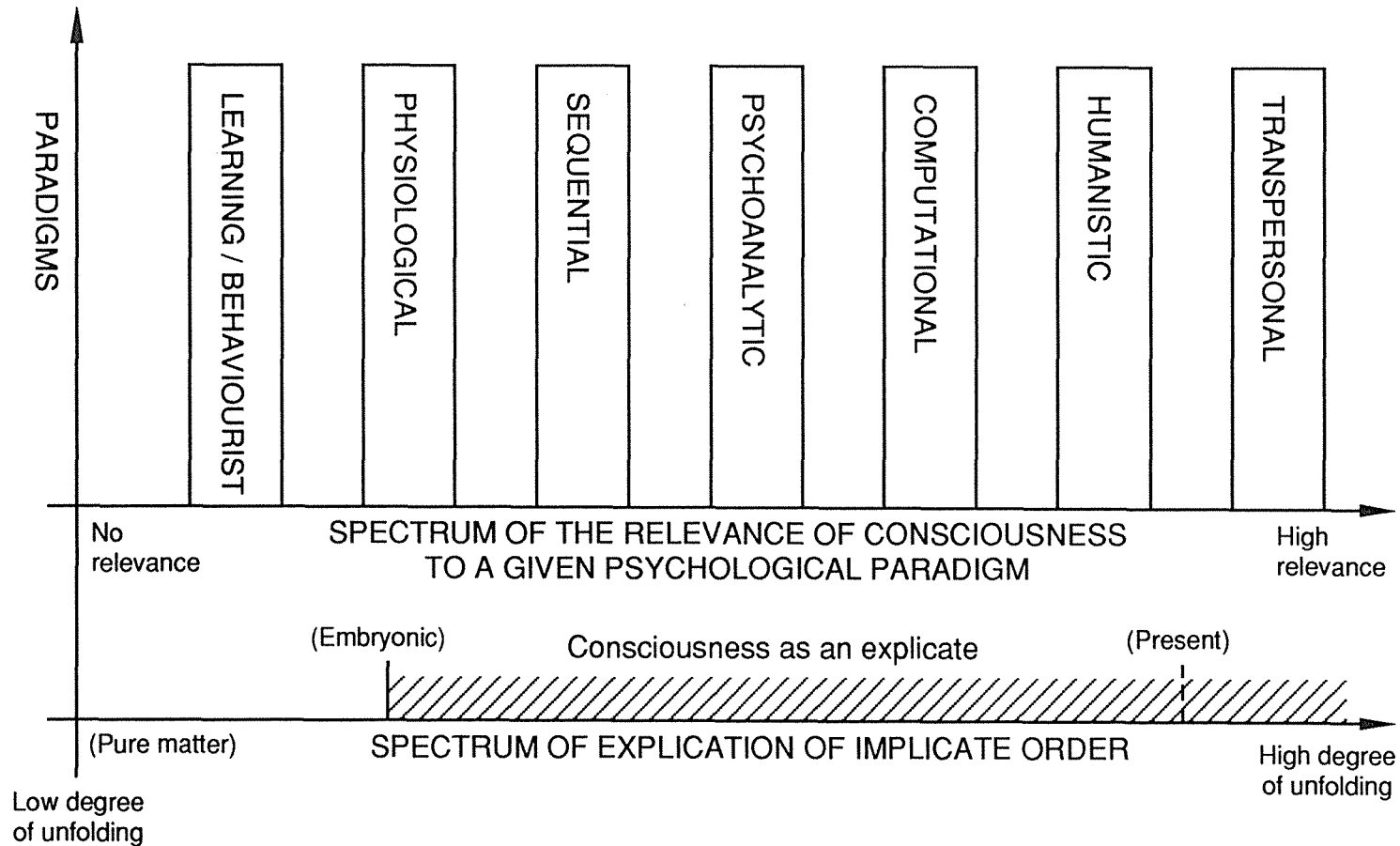


Figure 6.1 The psychological paradigms, consciousness and the spectrum of explication

the fact that I have placed the Learning/Behaviourist paradigm to the left of the point at which consciousness evolves must not be taken in a quantitative way. However, by so placing it, I do imply that this paradigm is almost exclusively addressing that aspect of the explicate order that appeared prior to the unfolding of Mind (ie, biological response mechanisms). Similarly, by placing the Transpersonal paradigm to the right of the line marking our present stage of consciousness, I am not making a quantitative statement. But I am implying that this paradigm addresses that which consciousness has yet to become.

For the present, these placings remain tentative. However, I shall return to this figure again, and see whether the placings have become less tentative in the light of the intervening discussion. As a lead into this further discussion, it is necessary to revisit my model.

THE IMPLICATE-EXPLICATE MODEL REVISITED

Recall that, in my model, Mind is a very high level or region within the implicate order, and that it explicates itself as consciousness, where consciousness operates through a brain (as far as this planet is concerned). Recall also that it is the explication of Mind that gives rise to the evolution of consciousness.

At first, when Mind began the explication process, the resulting consciousness was embryonic. As more of mind explicated itself, consciousness steadily became an entity in its own right, having properties of its own. As the process of Mind's explication continued, consciousness acquired wider qualities and gained in autonomy. A point was reached, most likely with the emergence of the mammals, where the first traces of a communications path were established between Mind and consciousness.

Initially, the information communicated down this path was limited for two reasons. Firstly, this nascent path had very limited bandwidth, thus restricting the amount of information that could be conveyed at any one time. Secondly, the limited degree of consciousness and relative simplicity of the neural structures (low level of computing power in a computer

analogy) restricted the amount of information that could be processed. As consciousness progressed in its passage through the mammalian species, the bandwidth of this communications path increased, along with an increase in neural complexity and an increase in consciousness.

Eventually, with the appearance of protohumans, consciousness reached a fairly high degree of autonomy. Recall that I used a series of computer analogies to characterise the various stages of autonomy achieved. It is at the appearance of the hominids that we see the communications path really coming into its own, where Mind comes to directly influence consciousness, and consciousness itself becomes able to influence the further unfolding of Mind.

At first, because this was occurring in species that lacked speech, the information exchange was non-verbal. Much of it would have remained at the unconsciousness level, and some of it would have been at the dream level. With *Homo neanderthalensis sapiens*, Mind was able to produce powerful images and so direct the lives of these early humans, and eventually led to the acquisition of speech, probably with Cro-Magnon (*Homo sapiens sapiens*). For my description of the early stages of speech acquisition, I borrowed from Julian Jaynes' notion of the bicameral mind, and argued that Mind began to communicate directly in the form of heard voices. This was necessary at this stage of hominid evolution because, while consciousness had considerable powers and autonomy, guidance was needed for a species that had virtually no natural defences and was living in a harsh and hostile world, where highly organised and efficient predators abounded.

With the full unfolding of human speech and other qualities, the mode of direct communications by means of heard voices ceased, and (to use Jaynes' term) the bicameral mind broke down, and humans asserted their own freedom. This assertiveness was especially the outcome of speech acquisition, as Leslie Dewart so ably argues. Thus, with *Homo sapiens sapiens*, we see the full flowering of autonomy, for which I used as an analogy

a full AI CAI system. This led to a much reduced use of the direct communications from Mind to its outpost, and a greater and greater amount of decision-making began to occur within the consciousness of the individual.

In modern humans, this has reached a zenith, wherein consciousness is fully autonomous, and virtually all decisions are made at the local level. However, this is not to say that Mind no longer has influence. It does, especially via dreams and all those subconscious urges that influence our behaviour. At the end of Chapter 5, I argued that the degree of autonomy we experience has led to a situation which is akin to the student users of the full-blown AI CAI system becoming so involved in the exercise of their local autonomy as to forget to utilise the full potential of the system's software. I further argued that, for the most part, the interaction is now between consciousness and the brain, where the two entities act together as a complete stand-alone unit. The focus is outward into the sensory world and so consciousness-brain has become heavily sense-conditioned, having all that it needs for survival in this modern world.

At this advanced stage, the communications path need not be used in order to conduct one's life in the explicate realm. This greatly reduced use of more direct communications between Mind and its explicate is the price we have had to pay for the very high level of conscious autonomy we have acquired as a species. This means that the earlier direct contact with Mind can be lost, because consciousness exercises its freedom. In doing this, however, consciousness also forfeits the ability to tap the vast resources of the implicate order, and to remain in harmony with it. While this breaking free from the parenthood of Mind can be seen as a sign of maturation, it carries with it the danger of imbalance, and atrophication of the creative well-spring of the human psyche.

While, as a species, we may have the autonomy we need to survive, there is a difference between survival and continued evolution. It may be true that with the current level of consciousness-brain development, we have all it takes to survive, and to avoid some global disaster (now more likely to be ecological rather than some nuclear holocaust). But even if

this is true, I argue that, as a species, we run the risk of standing still if we continue in this present mode. I argue thus because, in my model, Mind is crucial to the further unfolding of consciousness and hence to human evolution. In cutting ourselves off from our source, we have engendered existential loneliness, which manifests as a lack of our full potential as a species. We know from studies of the evolution of earlier species (ie, those discussed in Chapter 5) that there is a high price to be paid for standing still. Adaptability has been a major factor in determining which species continue to evolve and those that go under. I argue that, if we are not careful as a species, our wonderful adaptability could lead to a rigid adaption to the world we have created. This could result in having created an evolutionary cul-de-sac for ourselves, with little chance of escape.

PSYCHOLOGICAL PARADIGMS AND THE IMPLICATE-EXPLICATE ORDERS

Recall that the explicate realm embraces all that we regard as the sensory realm, whether this is sensed unaided or with instrumentation (eg, telescopes and microscopes in the visual field). From the viewpoint of psychology, the explicate order includes the human body in its entirety and all externally observable or measurable behaviours. In particular, it includes internal neural structures and the processes that take place in these structures (chemical and electrical).

Recall that the implicate order contains all that is hidden from the senses, unaided or otherwise, where the explicate realm derives from the implicate order. Within the implicate order there lies enfolded all that might ever become explicated. Moreover, within the implicate order, everything is enfolded within everything else. This is quite different to the explicate order, in which entities occupy their own discrete portion of space-time. From the viewpoint of psychology, the implicate order is that which lies back of all internal processes that give rise to measurable behaviours.

Most of the discipline of Psychology seems to sense that there is something lying back of all observable-measurable behaviours. However, there is a wide variation in the extent to which

this something is recognised or named. Where the existence of this something is faced, some of the names arising include, mind, consciousness and psyche.

We are now in a position to consider in greater depth the relationship between the psychological paradigms established in the first section, my implicate-explicate model, and my placings of the paradigms in figure 6.1.

In figure 6.1, I have placed the Learning/Behaviourist paradigm closest to the pure matter end of the explicate spectrum. This paradigm is essentially physicalist and so does not recognise the existence or even need for an implicate order. This shows in the fact that terms such as mind, consciousness, psyche, thought, intentionality and motivation are generally excluded from the vocabulary of this paradigm. This paradigm feels a discomfort with such terms, and feels that they detract from a real understanding of human behaviour. Thus, at this end of the spectrum, we have a focus purely on the explicate realm. This is not to say that those who subscribe to this paradigm use such a term as "explicate", or use such a category as the explicate order. They do not, because they do not recognise anything like the implicate order and hence any such distinction as that between the explicate realm and the implicate order. For this paradigm there is only the one category of things -- physical matter in all its various forms.

At the other end of my spectrum, I have placed the Transpersonal paradigm. This paradigm concedes the existence of that which remains forever hidden, and which transcends the sensory realm, while recognising the existence and influence of the sensory realm. This recognition gives the paradigm considerable explanatory power, enabling it to deal with all that the other paradigms deal with (eg, reflex arcs, reinforcement contingencies, neural processes, developmental stages, cognition, mental and emotional disorders, and so on) and to deal with other concerns as well.

However, from the viewpoint of mainstream psychology, the Transpersonal paradigm is regarded as on the fringe of acceptability. I argue that this is so because mainstream psychology has a built-in bias toward the physicalist model, hence (whether it knows it or not) a bias toward the pure matter end of the explicate order spectrum depicted in figure 6.1. This bias exists in varying degrees, hence the ranking of the paradigms along my spectrum of explication.

At one end, the bias is so extreme that it leads to the rejection of anything that hints at something other than physical matter. This is basically the Learning/Behaviourist position. As we move along the explicate spectrum, in the direction of greater and greater degrees of the unfolding of consciousness, the physicalist bias diminishes. Thus, at the Sequential and Computational paradigms, the bias is considerably weakened. This is not to say that it is non-existent. The import given to genetics in the Sequential paradigm and to the digital computer in the Computational paradigm shows that there is still a fair degree of allegiance to physical matter. However, to offset this, both paradigms are comfortable with the terms consciousness and its derivatives, at least to the extent that intelligence, thinking and intentionality, as examples, are thoroughly dealt with in both paradigms (eg, Piaget's theory of intellectual development and the manner in which mind reconstructs the real world in cognitive science).

If the implicate-explicate model of consciousness and its evolution that I have developed over the past five chapters has validity, then it would have the effect of pulling fringe psychological paradigms such as the Transpersonal closer to the mainstream. Conversely, it would have the effect of pushing the heavily physicalist oriented paradigms (eg, Learning/Behaviourist) out onto the fringe, in that such paradigms would be seen as a special case of a much more general set of theories. This would not make such paradigms wrong or lacking in use. They would retain some explanatory power, but would come to be seen as a specific focus that can do a special job, but cannot adequately operate outside of that narrow focus.

In all this, I am suggesting the use of my implicate-explicate model as a metaparadigm (perhaps more correctly, an *ordering principle*), in accordance with which psychological paradigms can be arranged or ordered. In this way, the relevance and power of each paradigm can be seen, along with a clearer view as to any given paradigm's limitations and field of application. For example, it may be appropriate to view humans as a machine under some circumstances (such as in some neuropsychological research, or in the case of certain organically induced behavioural disorders). Under other circumstances, such a paradigm would be most inappropriate (as for example, when dealing with altered states of consciousness). There will be occasions where paradigms need to be combined to explain certain aspects of human nature. For example, the full study of psychopathology needs more than the Psychoanalytic paradigm, because developmental issues are involved, and so is consciousness, and even Mind.

In my model consciousness is a high-order explicate. This enables consciousness to be a bridging factor between those paradigms that are wholly explicate oriented and those that are wholly implicate oriented. In this way, a balanced view can be arrived at. For example, in neuropsychology, the admission of consciousness into the equation does not necessarily entail accepting a full-blown transpersonal view. This is because my model can explain the brain-consciousness relationship, without getting tangled up in Cartesian mind-body dualism. However, in the case where one might be researching the relationship between, say, neural processes, consciousness, and mystical states, then my model permits the relationship between Mind and consciousness to enter the picture, and yet leave the brain-consciousness picture intact. In this way, the research can be guided without excluding either explicate phenomena or the implicate order. For example, research has been conducted using advanced Yogis as subjects, where the aim was to investigate a given Yogi's electroencephalographic (EEG) processes while in deep meditation, and to see if the Yogi's claimed altered state of consciousness correlated with changes to his EEG during mediation, by comparison with the non-meditational EEG (eg, Annand et al, 1961)

There are those who see psychology as an agent for proactive change within society, and I confess to being one who sees it thus. If this view of psychology is valid, then it is all the more important to be able to assess psychological paradigms by use of some metaparadigm, so that the appropriate psychological *tools* (theoretical or practical) can be selected for a given job. But I view psychology as more than simply an agent for change, for it is the one branch of science that claims to deal with human behaviour. This gives to psychology a great deal of responsibility in the world of science, where its pronouncements have power and influence. This is of concern because, as I have tried to show in my placings of the psychological paradigms, there is a considerable bias toward pure matter, and hence to a materialistic view of life. If psychology at large acts to reinforce a materialistic world view, then it also hinders the breakthrough that will lead to reestablishing our link with Mind. While there are modern systems of thought that do encourage such a breakthrough (eg, some modern Western interpretations of ancient Eastern teachings, often called *New Age* teachings), they do not have the authority of a recognised science. Thus, as a science, psychology has a special responsibility, where it may be the one branch of science that can bring about a global attitudinal change. This thought leads me on to considering the means by which we might, as a species, reestablish our link with Mind, and what the initial outcome of doing this might be.

THE EVOLUTION OF CONSCIOUSNESS: AN EPILOGUE

I wish to end this thesis with some speculations regarding how we might re-establish our links with Mind (as the implicate order) and how this re-establishment might lead to the next immediate step in the evolution of consciousness. That is, there are two distinct stages. Firstly, how to restart the process of Mind unfolding, thus pushing forward the evolution of consciousness. Secondly, what we might expect were the restarting to be globally successful. Speculation under the first heading comes relatively readily for me, and is less speculation than the logical extension of an age-old and well tried process. The discussion under the second heading is much more speculative. However, it remains grounded in the laws I have postulated for my I-E model.

Restarting the evolution of consciousness

Recall that, earlier in this Chapter and elsewhere in this thesis, I have suggested that the degree of conscious autonomy we have attained means that we are no longer using the communications path between Mind and consciousness as we once were. In exercising its high degree of freedom, consciousness in modern humans has all but cut itself off from its source (Mind). I do not believe that the communications path can atrophy, because information still comes down it (we still dream) and returns along it (we create new visions in art and science). But, we seem to be forfeiting the conscious use of that pathway. This seems an inevitable phase, and is the temporary price that we have had to pay for taking consciousness to such a high degree of autonomy. However, I do not believe that it need become a permanent condition, but merely a transitional stage to some new turn of the spiral.

In the earlier phase of the development of human consciousness, around the time when human speech was being acquired, Mind directed the further explication of consciousness, and the communications path was fully active. However, the individual was for the most part a passive recipient. Modern humans have sufficient conscious autonomy now to actively use this communications path and establish a dynamic two-way interaction between their consciousness and Mind. If this is so, we can re-establish our link with Mind, but on this new turn of the spiral we will have conscious control over the process. The means by which this can be done have been in existence for a long time, and have been developed almost to the level of a science in the Eastern religious and mystical traditions. The techniques are various, but they can all be loosely placed under the heading of *Meditation*.

The topic of meditation is too vast to cover adequately in this thesis. There is now an enormous volume of literature on this topic, which explores the forms meditation takes, the stages the meditator passes through as proficiency is acquired, the neurophysiological changes involved and the benefits that accrue from the practice (eg, Murphy & Donovan, 1983). Whatever other functions are ascribed to the process of meditation, I believe that its prime function is that of re-establishing and maintaining the link between consciousness and

Mind. I argue this regardless of the variety of meditational techniques adopted. More than this, I speculate that the very appearance of the technique (no matter how called) is evidence that Mind has been sending advanced information down the communications path for many thousands of years, even if there were only the few that were influenced by this information and could turn it into a system of training.

Everyone who first starts meditating finds it a very difficult practice. First of all, the physical body itself seems to rebel against the need to sit perfectly still for a half an hour or more. It is as though the body assails one's awareness with its full armoury of twitches, itches, cramps and spasms. Battling against this can cause many to abandon the process before they have even begun. There is a need for intense discipline to conquer the grosser aspects of the explicate realm.

Beyond the stage of control of the body (quelling the flesh as some mystics have described it), there lies the stage of controlling the cognitive processes. These processes are extremely hard to bring under control, and yet this control is a prerequisite for successful meditation. The mental processes seem to have a will of their own, and will not be readily tamed. However, with frequent and earnest practice, the cognitive processes do initially slow down during each successive meditation session, and eventually become still. When this state can be entered without difficulty, then meditation proper can begin.

Beyond this stage of cognitive stillness, there are various possibilities. One might try, as examples, to produce a visualisation, focus on the breath or mentally intone a mantram or prayer. These are among the many recommended techniques for establishing the habit of meditation. However, because they are in the category of habit forming techniques, when well established, they can act as their own blockage to full contact with Mind, because they hold the individual consciousness at the level of the sensory (explicate) world. To fully establish and maintain direct communication with Mind entails letting go of all sensory modes, and entering into a one-pointed state of consciousness. In this mode, it is as though

consciousness (as an explicate) has turned its back on the explicate realm, and is gazing into the implicate realm, and looking into the heart of Mind. This more advanced stage is just as difficult to achieve as were the earlier stages of conquering the vagaries of the body and cognitive processes.

Eventually, advanced meditators can pass quickly through the first two stages of control and into the stage of letting go. While passage through the first two stages entailed control (hence will and discipline), paradoxically the stage of letting go cannot be achieved in this way. The reason for this is that discipline and will power are products of the highly autonomous consciousness, and it is this very autonomy that has erected the barrier between us and Mind. This barrier has to be allowed to fall. Any attempt to push it aside or destroy it, paradoxically strengthens it. This is well brought out in the literature on Zen meditation, which makes it clear that letting-go is the secret to success in meditation, and that the harder one tries the worse things get (note also the spirit of the teachings given by Lao Tse in the *Tao te Ching*).

In essence, the technique talked of here is more that of turning away from all that is explicate, but without strain or violence. In this movement of turning away, or of letting go, I would argue that there is an automatic turning to Mind. This fact may not be discussed, or even recognised, in some meditational traditions (eg, Theravadin, which does not concede to a Mind to be turned to; Humphreys, 1958). But I argue from the basis of my model, in which Mind is the key factor. However, even when this turning to Mind is achieved, initially, most find there is nothing for consciousness to detect. This is an illusion because, in reality, Mind is there and waiting. The seeming lack of contact is the result of years of individual exercise of conscious autonomy, which has tuned consciousness to respond either outwardly to the sensory world, or inwardly to its representations. We are effectively blind to the implicate realm, and have to learn to *see* there in the same way that a neonate has to learn to see and make sense of the explicate realm.

In time, the advanced meditator begins to *sense* (this explicate term is inadequate but is the best available) the vastness of Mind (as a very high region of the implicate order). What is sensed may translate down into visual imagery, into auditions or into feelings (eg, of expansion or of great peace). Conversely, the meditator may not experience the contact in explicate terms at all, and yet be aware at some level of vast power, or energy, or possibilities. What happens during the meditation session is of much less importance than the fact that contact has been made. The meditator has consciously re-established the link with his/her source.

While during meditation, information may pour down this channel at times, it is what occurs in one's everyday waking life that matters most. Again, there is a large amount of literature on the benefits of advanced meditation (see the bibliography mentioned above). The more widely documented of these benefits range from improved physical functioning (eg, better health, higher resistance to disease and greater energy levels), through greater emotional balance and control (eg, a reduction of anger or depression) to more effective cognitive processes (eg, improved memory, and clearer thought processes).

Though the above listed benefits are highly valuable, in themselves they would lead to more of the same. That is, each of these improvements would enable the individual to even more effectively exercise conscious autonomy, and so further block the communications path to Mind. The ultimate benefits are those that manifest Mind at the explicate level. By this I refer to attributes such as detachment, equanimity, compassion and wisdom, as examples. These may appear as high-sounding attributes. They are, and are certainly not all acquired in full measure in one's first meditation session. But they are acquired nonetheless. In fact, with regular contact with Mind during meditation, there is no avoiding these attributes. This is because regular conscious contact with Mind initiates a new phase of the unfolding of Mind. This phase had to wait until humans acquired a high degree of conscious autonomy. But, as I have argued, this acquisition carries its own price.

The next step in the evolution of consciousness

So we have already the means whereby we can initiate the new mode of Mind's unfolding. But where will this new mode take human conscious, to what new level of operating? My speculations as to what the next step in the evolution of human consciousness might be are based on the characteristics of my I-E model, where the nature of Mind is the key factor. In this final section, I will restrict myself to speculating on the nature of the next step, and avoid speculating on what the acquisition of this new mode of consciousness might lead to in terms of societal restructuring. This further speculation is very tempting, but would be made by one having a present-day consciousness with all its limitations and conditionings. It is one thing to make an intelligent guess as to what the consciousness of one who has made the next step might be like. It is a very different and much more difficult thing to make predictions as to what sort of world might come about if most living in it possessed this higher level of consciousness.

I speculate that the next step in the evolution of consciousness would best be described in terms of two qualities: a mature awareness of wholeness in all its forms, and the active emergence of and allegiance to inwardly derived values rather than obedience to externally enforced laws. I speculate thus, because wholeness and inwardness are essential qualities of Mind. I am not saying that these two qualities are not possessed at the conscious level at present by humans. However, I am saying that, at present, these essential qualities have made only an embryonic appearance in most humans. This is not to say that a small (perhaps very small) percentage of humans do not possess something of these qualities at the conscious level. I am convinced that such people do exist. But here I am speculating at the global level of humanity as a whole. Note that, having more globally achieved this new mode of consciousness, the process of meditation would become unnecessary. That is, meditation was a technique for making contact, but now becomes redundant. Once the breakthrough occurs in a global sense, thereafter, everyone would be able to enter this new mode of consciousness without recourse to so-called spiritual disciplines (eg, the stages delineated in the system of Yoga).

At the level of the individual, awareness of wholeness would engender an intrinsic respect for other lifeforms (human and non-human) and foster an attitude that would lead away from those actions which harm others and endangers the planet. Such a degree of sensed wholeness implies a level of rapport with all other life-forms as to amount almost to telepathic union with them. This is not to say that such a person is able to read the thoughts of other humans, or enter the consciousness of infra-humans. Rather, there would be a very high level of empathy with all that lives, giving rise to a deep respect for all others. Because of this, in my opinion, it would be very difficult, if not impossible, for one who was strongly motivated by such a sense of wholeness to act deliberately in a truly life-negating way. It is interesting to see this movement toward a sense of wholeness in the light of my relevance spectrum in figure 6.1. In an age where this level of wholeness was the norm, I would speculate that the Humanistic and Transpersonal paradigms would be the norm for psychology, where the other paradigms would have become still usable but narrow subdisciplines.

The allegiance to inward values would encourage a movement toward intellectual and spiritual autonomy, and away from the herdlike following of imposed credos. This is not to say that one possessing this level of consciousness would disobey the laws of society without due regard to their reasonableness. The first quality (wholeness) would mitigate against such wanton action. However, as this inwardness derives from what I have called the source of all that is (Mind), it would give its possessor a fine sense of discrimination in regard to societal norms (and the rules/laws that derive from them). This would take the decision-making in regard to obedience or disobedience to such norms to a level beyond that available to most today. Beyond this, it would lead to a re-evaluation of societal norms. What I am saying here is that the ethical sense, and moral personhood would no longer be an issue of obedience to some imposed law (human or otherwise), but would arise naturally from within. In this can be seen the marked difference to the notion expressed by people such as Skinner in his *Beyond Freedom and Dignity*, where behaviour is controlled by social engineering. Again, it is interesting to see this shift to inwardness in the light of my relevance spectrum and the

psychological paradigms. The Learning/Behaviourist paradigm, with its focus on stimuli (and the responses they elicit) is concerned with externals. In a world of people whose actions are derived inwardly, this paradigm would have very limited use.

It might seem, at first glance, that these two characteristics (awareness of wholeness and allegiance to inwardly derived values) are in opposition, or at least might create some conflict. But this is to fail to see that both derive from Mind. Mind, as most likely the highest region of the implicate order, seeks to unify what was initially explicated under the more automatic and unconsciousness mode, and this it does through consciousness. Thus, manifestations of Mind are, by their very nature, wholesome and life-affirming. It is only our recent and temporary abuse of conscious autonomy that has led to behaviours and situations that are life-negating. Mind is the essence of all that is truly creative and novel, and opposed to that which stultifies. Thus, there is no conflict, because the values that emerge as more of Mind unfolds within the individual could only lead to life-affirming actions, where these actions would be guided by wholeness and not by separatedness.

As stated above, I will not embark on speculation as to what this new mode of consciousness might lead to in terms of the restructuring of society. However, in terms of consciousness, I would like to end with some further brief discussion as to where these qualities might lead to both at the individual level and at the global level.

In this, I make the assumption that the greater proportion of human kind have re-established contact with Mind, and possess the new mode of consciousness I have described above. At the broadest level I speculate that, at least, two global trends become possible. The two trends I have selected are diametric opposites and tend to reflect the essential difference between the Eastern and Western spiritual traditions. No doubt, other trends exist as possibilities between these two extremes. Seen from the Western viewpoint, the Eastern spiritual trend appears to be nihilistic and life-negating. Conversely, seen from the Eastern viewpoint, the Western spiritual trend seems materialistic.

One trend (I will call Eastern in the light of the above comments) might best be described as a turning away from the explicate world in the sense that the Buddhist is said to do in seeking Nirvana. This trend would be away from, as examples, materialism, possessions, competing and control of the physical environment. However, I do not see in this an abdication of responsibility for the world and its denizens, because the two discussed qualities would enhance such a sense of responsibility. Rather, I would see human society as becoming simpler, and as more harmonious with the life-forms it shares the planet with. The goal of such a trend is mystical in that what is ultimately sought is reabsorption into some non-physical condition. Perhaps this trend would be the precursor to consciousness finally becoming so Mindlike as to no longer be an explicate in the sense that it needs physical manifestation. I here imply some form of global mind, in which individual consciousness is absorbed, where this global mind becomes the new explicate of Mind. But here, speculation had best end.

Another trend (I call Western) might be toward a greater individuality rather than toward mystical absorption. This is not to be seen as a turning away from Mind and further into the explicate realm. This is the present-day mode, and one which the breakthrough described earlier would have brought an end to. The individuality I talk of here is not to be confused with present-day individualism, with its inherent selfishness. Rather, I talk of an individual in the sense of being intellectually and spiritually free, who can make truly informed choices regarding his/her actions. These choices would reflect both the individual need and the needs of the whole. What really distinguishes this polar extreme from the *Eastern* one, is its focus on **this world** and all that that entails. I would see the actions of such individuals as leading to an emphasis on cooperation, and on the restructuring of global socio-economics such as to bring about a fully harmonious use of the planet's resources. In this, individuals would retain their individuality (no dewdrops merging with the mystic ocean) and yet find unity in their diversity. In this way I see that the polar extremes of the tyranny of destructive individualism and the

tyranny of the mindless collective would be avoided, where these polar opposites are transcended.

At this juncture I wish to leave further speculation for the so inclined reader. I remind my reader that what I have offered in this final section is in the spirit of speculation, and suggestions for further lines of thinking. These speculations and suggestions should not be taken as some sort of prophecy or, worse still, a dogmatic assertion. I do not really know what may come of a universal and dynamic contact with Mind, and the evolutionary step it will lead to. But I am convinced that it can be achieved, and that it will be worth the effort.

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