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ABSTRACT

Some possible conceptualizations of divine action within the world are considered in the light of modern scientific insights. A selection of types of approach is investigated, including: (i) that which makes use of a strong theological determinism; (ii) that which formulates non-deterministic models of God's action to be in principle careless of the particular findings of modern science; (iii) that which sees science itself as the key to understanding how God might act; (iv) that of process theology which views God as immanently present within the physical processes themselves. In the evaluation of these models, a critical realism is adopted with regard to scientific findings.

It is concluded that the type of approach (ii) independent of science is not likely to succeed. Also, models of type (iii) are unsatisfactory. Types (i) and (iv), theological determinism and process theology, in their different ways offer more promise, although each has its own characteristic problems and limitations. However, it is admitted that any finite theological system is likely to encounter problematic areas; it therefore remains possible that the most adequate such system overall might choose its difficulties to be in relation to science.

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No part of the material presented in this thesis has been previously submitted to this or any other university for the award of a degree.

Chapter 1: Introduction

Christianity proclaims a God who has acted and continues to act in the world. In the biblical story of the Israelites, through Exodus and Exile, God's word is shown to be powerful and effective in shaping human history; and at the climax of that history the Word becomes incarnate, enacting God's redemption through crucifixion and resurrection. That God can act is thus never seriously queried by the biblical witnesses; for them, the only question is the correct interpretation of his action. Even in that most tortured of the books of the Bible, Job does not question that it is God who has brought misfortune upon him. Rather, his complaint is against God's justice, which yet finds its answer in terms of God's mighty creative activity. It is God's action which evokes our religious response.

Equally in the centuries after Christ was no particular concern shown about questions of God's ability to act in creation. Augustine did propose an account of the relationship between divine and creaturely causation, which Aquinas was later to develop more fully into the classical concept of secondary causation[1]. But the underlying issues here originated in the doctrine of God, rather than of creation. If God's transcendence should be understood in Platonic terms of eternal changelessness, how could he then be involved in the particularities of human history? How exactly God could bring about change in the world was not the point at issue; indeed, to the extent that it is a question understood against the background of modern scientific empiricism, it was hardly a point at all.

In the modern age, questions about God's action in the world have been transformed. That is not to say that those questions of God's agency asked by the theologians of medieval and earlier times have lost their relevance. They still raise profound issues of importance. But, with the rise of modern science and its increasing success in explaining previously mysterious phenomena, the emphasis of such questions has now changed. Maurice Wiles makes the point suc-

cinctly:

> "The various forms of scientific study which dominate our culture have done much to disclose patterns of regularity in the way the world functions. The world as we experience it appears to us a much more regularly ordered world than it did to our predecessors in the faith. Our difficulty in conceiving of God's action is more likely to be focussed on how and where that action is to be located or identified within the world of human experience."[2]

Such a difficulty has had a great effect on the history of theology from the eighteenth century onwards[3]. The world-view which has been ascribed to Newton (although incorrectly[4]) conceived creation as a deterministic mechanism such as a clock. Here there was no role for God except to create the universe and to set it spinning upon its way. Thus did the deists expunge divine activity altogether from the world; only the wonder of creation could lead the creature to the worship of its author.

In reaction to the austere religion of deism, liberalism in the nineteenth century tried to reclaim God's immanent activity in the world. But it did so by identifying God's activity more or less completely with the causal laws which science revealed. Notions of evolutionary progress would enable God's will to be understood in terms of the advance of society. Human freedom was affirmed, whilst miracle disappeared. Friedrich Schleiermacher, for instance, allowed that causal law and divine providence were the same. Yet how God could act through causal law, without theism slipping into pantheism, was never made clear.

In the twentieth century, Karl Barth in turn led a reaction against liberal theology. Insofar as God's action is concerned, neo-orthodoxy represented a restatement of the classical Protestant affirmation of God's supreme sovereignty and freedom in creation. In the 1940's, this led to the emergence of the biblical theology movement, which stressed the pivotal importance of God's mighty acts as described in the Bible, against the downgrading effected by liberal theology. Ernest Wright was a leading exponent of biblical theology and wrote of it:

> "There is, first, the peculiar attention [of the Bible] to history and to historical traditions as the primary sphere in which God reveals himself... Inner revelation is thus concrete and definite, since it is always correlated with a historical act of God which is the primary locus of con-

centration..."

> "In dealing with biblical theology, therefore, primary attention must be given, not to abstractions concerning the nature of God, but to history. This involves the use of all our tools for historical criticism, for if we fail to take history every bit as seriously as the biblical writers, we shall not be expositors of biblical faith."[5]

Biblical theology attempted to balance an understanding of the world as causally ordered with an acceptance of the witness of faith recorded in the Bible. But it came under criticism for failing to make clear what God was actually understood to do in these mighty acts. Frank Dilley, for instance, attacked the whole programme of biblical theology:

> "[The Biblical theologian's] plight is not a happy one. If he says that God does interfere in the workings of nature and history, then he violates his understanding of modern science and the validity of scientific explanation. He does not believe that people walk on water or that corpses rise into the air. If, on the other hand, he maintains that God does *not* interfere, then he has to give up the biblical notion of a God who acts specially in history. He speaks then of "acts of God" in terms of east winds and visions, using biblical language to assert liberal content. He refuses to be explicit as to what he means, perhaps because any explication would make clear that there is no alternative to conservatism and liberalism except a merely verbal one. In short, unless he equivocates he is lost."[6]

Langdon Gilkey had made a similar critique of biblical theology, arguing that its attempt to repudiate liberalism fails:

> "The causal nexus in space and time which Enlightenment science and philosophy introduced into the Western mind and which was assumed by liberalism is also assumed by modern theologians and scholars; since they participate in the modern world of science both intellectually and existentially, they can scarcely do anything else."[7]

This statement is probably too sweeping to be accepted *tout court*. In particular, as a matter of fact some theologians do feel themselves free to assert God's miraculous or direct activity in the world. Nevertheless, the point which Gilkey makes needs to be taken seriously. In the modern age we assess claims for divine action in a different light to our forebears and that assessment includes an expectation that events will usually conform to scientific cause and effect. As Rudolf Bultmann wrote:

> "We cannot use electric lights and radios and, in the event of illness, avail ourselves of modern medical and clinical means and at the same time believe in the spirit and won-

> der world of the New Testament. And if we suppose that we can do so ourselves, we must be clear that we can represent this as the attitude of Christian faith only by making the Christian proclamation unintelligible and impossible for our contemporaries."[8]

His problem was how to take seriously the message of the New Testament writers whilst at the same time acknowledging that their world-view is virtually incredible to us in the contemporary world. Disease, for instance, is no longer deemed to be the manifestation of demon possession. The problem has arisen for us to whom the forces of nature present themselves as regimented. We have difficulties conceiving how God can be active except through those same powers of nature; spirits and other supernatural agents have largely disappeared from our everyday framework of beliefs. It is perhaps not too much of an exaggeration to say that, in our culture, we have assimilated the outlook that the forces of nature are supreme and bow to no one. The world is truly autonomous, we often assume, and the laws of nature have supreme jurisdiction.

It therefore becomes problematical, if not merely eccentric, for us to deny the validity of much scientific insight. But how should divine action in our world then be conceived? That is the question with which this thesis is concerned. We wish to investigate the models of divine action presented by a range of writers and to assess their coherence or otherwise with the claims of modern science. Thereby we hope to delineate those approaches to theology which might create the fewest difficulties in the light of science's discoveries. Now it may be acknowledged that any theological system will have its weak points where tensions exist either within the system itself or between the system and aspects of our experience. We are subject to a creaturely limitation in attempts to comprehend God and his ways. It follows that the problems which inevitably arise with any theological account may in fact best be placed in the area of its coherence with science. Nevertheless, our aim is to make clearer which types of account are likely to encounter such difficulties.

Before we proceed to sketch the course of the thesis, however, it will be of help in maintaining clarity to mention three areas related to our theme which, although of great importance, are not themselves the focus of our interest.

First, we will not be concerned to produce an exhaustive account of God's action in the world. Such a brief would be too broad for us to cover adequately, being capable of incorporating almost every aspect of theology. Many wider concerns will be touched upon in the course of our investigation, but no direct consideration will be given to issues such as the problem of evil. It is admitted that much of the greatest importance will thereby be neglected.

Secondly, the question of miracles will not be of particular concern to us. This is not because the occurrence of the miraculous is not a topic of importance, nor is it simply because there may well be good theological grounds, beyond those of a particular scientific outlook, for asserting that God does not countenance miracles[9]. Rather, considerations about miracles appear to be subsidiary to wider questions of divine action and science. Without entering a full discussion, it seems unlikely that we should posit miracles to be the foundational means of God's interaction with the world. Thus, for instance, the Bible itself most often takes miracles to be a sign and confirmation of God's power, authority and purposes, but not a primary means of self-communication. The sign is frequently subsequent to the prophetic word and we may question how that prophetic word itself has been communicated. Furthermore, many Christians who are convinced of their full relationship with God do not claim to have any direct experience of the miraculous. If this is so, then the focus of God's interaction with his creation must be broader than on miracles alone.

To my mind, if one wishes to take a strong view about the regularity of nature and thus to deny the miraculous, then in fact any form of divine interaction, including what may be termed revelation, would be difficult to conceive, as will be discussed later. Indeed, this is one of the considerations that has led the self-styled Christian Humanists to deny any objective existence to God at all[10]. If we live within a world of effects each of which, in principle, can only have as its cause the action of another entity itself within the ambit of physical law, then it seems we have no room left for action from a God who is presumably without the web of those laws. Such a conclusion would be of far more significance for theology than the mere absence of miracle.

The third area with which this thesis will not be especially concerned is natural theology. That is, there will be no attempt to discern what may be known of God merely by the use of human reason and the data presented by the natural world around us. Once more, this is not to deny that such a study would be of importance. Many scholars who straddle the border between the disciplines of science and theology have in recent years attempted to raise the profile of natural theology, convinced that it is a vital area of thought in the modern age. One of these writers, John Polkinghorne, has written with evident frustration:

> "Theology cannot just be left to the theologians, as is made clear by the recent spectacle of a distinguished theologian writing over three hundred pages on God in creation with only an occasional and cursory reference to scientific insight."[11]

That may or may not be so, but it is not our concern. We wish to discover some of the implications for the whole of theology, including revealed religion, of the modern scientific world-view. Whether or how Christianity is dependent upon any particular form of natural theology is a subsidiary point.

An exhaustive discussion of God's action, miracles and natural theology are thus not at the centre of our interest. Rather, we want to probe the question of what constraints are placed upon models of divine action in the world if one is inclined to accept the veracity of science. Would the universal functioning of physical law render divine interaction impossible? Does modern science place limits on where God may act? Would divine interaction be detectable in principle by scientific methods?

The outline of the thesis is as follows. In chapter two we first study some approaches to God's action which apparently by-pass problems of the regularity of nature by finding God's activity in a description of reality independent of science's claims. These attempts are found to be unsatisfactory, however, and so chapter three proceeds to explore the view of the world to which modern science may commit us. This chapter endorses a scientific critical realism. Chapter four explores various issues which arise from theological determinism, should such determinism be linked in some manner to the measure of mechanical determinism revealed by science in the universe. Ques-

tions are raised about the possibility of revelation in such circumstances, and chapters five and six go on to explore two possible solutions: an anti-reductionist view whereby God may engage with the higher levels of reality which emerge from a simpler physical substratum; and a view which sees an opportunity for God's interaction with his creation in the openness of physical processes hinted at by the quantum and chaos theories. It is argued that neither of these approaches overcome an inherent contradiction found between allowing science's description of the world to be complete and God's interaction which is by definition non-physical. Chapter seven explores the different ideas of process theology. Although questioning such theology's adequacy, merit is found in its approach of modifying the underlying metaphysics both of science and theology. Finally, chapter eight draws together our conclusions.

Chapter 2: Modern Science and Divine Action as Independent Realities

It may be claimed that theology should take account of the whole range of human knowledge and experience if it is to reach towards a God who transcends every aspect of creation. Historically, this proposition certainly has some force, especially in the medieval tradition for which theology is the Queen of the Sciences. Thus, it can be argued, St Thomas Aquinas adopted an Aristotelian view of the world because it seemed to him to constitute the best science (in the modern sense)[1]. Later and for rather different purposes, apologists have gladly used science to bolster the argument from design for the existence of God, although with varying fortunes. Yet in none of these cases does one gain the impression that it is the reflection upon science which is critical in the formulation of theology. Aquinas, for instance, rejoices each time he succeeds in demonstrating that reason is consonant with prior revelation, but strictly maintains that order; it is revelation which is definitive. Not only is science not necessarily uppermost in these traditions, but there are other traditions which view science as being more or less irrelevant to the religious endeavour. Many of the Christian mystics, such as St John of the Cross, stressed the life of faith as something to be held onto even in the face of a complete lack of understanding.

There has therefore always been a tension in the relationship between revealed religion and natural theology. However, it is in later centuries that theologians have found themselves responding more directly to the tension arising from our scientific perception of the universe, as we have seen in the previous chapter. One response has been to insist that theology is concerned with an entirely independent area of enquiry from science, so that science should not have any direct bearing upon theology. Thus one hears it said that science is concerned with questions of "how", whilst theology addresses questions of "why". If it is possible to maintain such a clear division, then indeed a theologian need have no great concern

about questions of science.

In this chapter we shall investigate some understandings of divine activity which appear to be immune in principle from any scientific findings. If these theories are indeed found adequate, then modern science or its methodological justification will again hold little direct interest for the theologian. If not, we shall have to pay attention to science itself to conceive how God may interact with creation. We begin this survey of some such theories by considering the classical theory of secondary causation as propounded by Aquinas (although, of course, anachronistically so far as our interest in modern science is concerned) and its more recent development by Austin Farrer and others, before turning to the existentialist theology of Rudolf Bultmann and, finally, to the distinctive approach of Maurice Wiles.

(a) Secondary causation

At the heart of Christian theology there is an unresolved, although arguably creative, tension between God understood as both transcendent and also immanent in his creation. This tension makes itself felt in various ways. One of them is in the contrast between a remote God who allows his creation full autonomy, seen in human responsibility, and a God more immediately involved in our existence whose intimate presence may lead to a perceived loss of our own independent freedom. In his treatment of causation, Aquinas is careful to keep such a tension in balance. He wishes to preserve both God's providence and also sufficient dignity for his creatures to retain moral creditworthiness or blame. This he does by distinguishing first and secondary causes, the former belonging entirely to God and the latter exercised by his creatures.

If the notion of secondary causes is able to elucidate how God can maintain his providence in our world whilst at the same time allowing natural processes to operate unhindered, this might then provide a model of God's activity which would not conflict with modern science, whatever its findings.

Let us first consider what Aquinas understood by the notion of an efficient cause, the cornerstone of modern science, by turning

initially to the second of his Five Ways for proving God's existence. In it, Aquinas points to the fact that,

> "in the observable world we discover an order of efficient causes, but no cause is found, or ever could be found, of something efficiently causing itself."[2]

Excluding the possibility of an infinite series of efficient causes, there must be a first, uncaused cause, which is named "God". As Anthony Kenny emphasises[3], care should be taken not to interpret such a series of causes as being temporal. Aquinas was happy that infinite, temporal series of causes might exist: for instance,

> "it is not impossible to go on for ever in the series of men begetting men; but such a thing would be impossible if the generation of one man depended on another and on an element, and on the sun, and so on to infinity."[4]

What Aquinas refers to by his "order of causes" is the Aristotelian view that the active qualities of the elements of which creation is composed, such as heat and cold, are not sufficient to explain the rise of substantial forms, such as a newly-begotten human being. Rather, some further active principle is required, which Aquinas identifies with the heavenly bodies[5]. Whilst today we find such medieval astronomy implausible, we recall that Aquinas was writing centuries before Hume suggested that causal power is an unwarranted fiction. To the medieval mind, causation involved some form of power in its operation. Thus, we may understand the First Cause to be the end point of the series which explains how anything comes to have causal power at all: for instance, a stone falls because its nature is itself granted by the First Cause. The First Cause, we might paraphrase in anachronistic terms, is that which energises the universe.

With this understanding, God's creatures are able to act as secondary causes by channeling the powers granted to them. To illuminate the doctrine of secondary causation, the example may be used of an artisan wielding an axe in order to cut wood. Here, the cause of the wood's splitting is the blow by the axe. Equally, however, we are justified in claiming that it is the artisan who causes the effect by his own action. Thus the outcome is caused simultaneously by the axe (the secondary cause) and the artisan (the first cause).

This example is, of course, no more than analogous to the actual situation envisaged by Aquinas: God's influence penetrates far more deeply into any secondary cause than does the influence of the

workman into the axe. Yet the example nicely illustrates the problem of reconciling secondary causation with any true independence from God. For it seems that, even though the axe may be the immediate cause of the log's splitting, it is acting only within the tight constraints imposed by the agent who is in actuality controlling the event. It would be stretching our language beyond credibility to claim that the axe itself acted, and even more that it acted freely. The first and second causes do not act independently, but in consort with the first apparently controlling the second. Thus one is led to question whether secondary causation actually allows any measure of real freedom to creation, and so to explore a little further Aquinas' motivation in his description of secondary causes.

We first note that, unsurprisingly, Aquinas does not wish to divorce creation from God's oversight in any way:

> "We are bound to profess that divine Providence rules all things, not only in their general natures, but also as individuals."[6]

Rather, Aquinas emphasises secondary causation as a sign of God's goodness in allowing creatures a share in God's providential activity:

> "... divine Providence works through intermediaries. For God governs the lower through the higher, not from any impotence on his part, but from the abundance of his goodness imparting to creatures also the dignity of causing."[7]

Secondary causation is therefore not necessarily a means to freedom in any libertarian sense which we might understand, but a means of creation's reflecting God's generosity. However, if God's providence always comes to fruition even when through secondary causes (Aquinas also allows God's direct action through miracles), it is not easy to understand how his creatures can be said to be sharing in his activity at all, rather than being manipulated by it. Aquinas affirmed that,

> "what the plan of Providence has arranged to result necessarily and without fail will come about so, what too it has arranged to result contingently will come about so."[8]

Here, the possibility that secondary causes might allow the world to be autonomous of God seems to be put into doubt: a truly contingent event cannot be prearranged, even by God. We would appear to have a situation in which the world is like a theatre where actors extemporize, except that in reality there is also a script.

Aquinas has gone some way towards distancing the action of creatures from the direct action of their creator, but his concept of divine providence does not allow for any greater freedom and by no means a separation. So, when Aquinas writes,

> "although one whom God reprobates cannot gain grace, nevertheless the fact that he flounders in this or that sin happens of his own free will,"[9]

one cannot take that free will to indicate our autonomy from God. Aquinas, in short, was a compatibilist believing that theological determinism nevertheless allowed creaturely freedom.

It is against this background of thought that the concept of secondary causation is to be judged. Such causation was used by Aquinas to demonstrate how the universe might share in God's creative goodness, but not how the universe may operate independently from God. Thus, although we have argued that it is difficult to conceive how secondary causation can be an analogy for God's activity embedded in the physical processes of this world, this cannot in fact be a direct criticism of Aquinas. Nevertheless, secondary causes are inadequate as a means to understand how God's activity could exist alongside natural physical processes without their mutual interaction needing further explication.

(b) Austin Farrer and double agency

The struggle to see both human and divine action in one and the same event is perhaps basic to the religious intuition, whether or not the divine then entirely subjugates the human. Aquinas, we have seen, allowed the divine a free rein in this partnership; more recently, Austin Farrer propounded a view of divine action indebted to that of Aquinas, but without requiring total dominance by God. Instead of trying to see two agents in one and the same act, Farrer suggested that we should see two acts, one human and one divine, in the same event. The human act is then given a full integrity of its own within the context of the web of physical causation which surrounds it, whilst the divine act is also given scope to bring about its own designs.

Farrer takes a biblical story to be paradigmatic of this so-called double agency: the description of the Assyrians "as the rod of

God's anger" in their treatment of Israel. Through their policy, the Assyrians were no doubt advancing their own economic and political interests, without any knowledge of the God of Israel. Yet, Farrer emphasises, they were nevertheless accomplishing God's will:

> "On the theistic hypothesis, everything that is done in this world by intelligent creatures is done with two meanings: the meaning of the creature in acting, the meaning of the Creator in founding or supporting the action. Subjectively considered, there are two doings; physically there is but one event."[10]

This double agency, the notion that in freely following one's own motivations nevertheless one may be instrumental in fulfilling God's providence, is clearly biblical. Yet it is questionable whether it is strictly nonsense to speak of two agencies, rather than mere causes, being involved in the same action. One may understand how a log is split both by an axe and also by the hand of an artisan, but these causes are descriptions at different levels of freedom: only the artisan would be described as a free agent. On the other hand, Farrer maintains that both God and the human agent remain free. One may understand how the building of Solomon's temple, say, was the action both of the slaves who built it and of Solomon who ordered its construction. But here there is an acknowledged relationship between slave and master, in which the freedom of the slave is limited.

Farrer acknowledged the difficulty, but believed that the means whereby God's and the creature's agency are linked would forever remain mysterious:

> "We are concerned with [God's] purpose and action solely as an operation to which we commit ourselves. It is no part of our business to work any determinate system of communication. We do not find where and by what means to touch God nor where and by what means to undergo his touch... the causal joint (so to speak) between infinite and finite action plays and in the nature of the case can play no part in our concern with God and his will."[11]

And so Farrer is content that,

> "we *believe* that God's way of acting is the infinitely higher analogue of our way, but we cannot *conceive* it otherwise than in terms of our own."[12]

Accepting Farrer's view, then indeed there is nothing more to be said in the matter of God's agency: double agency would be the best analogous understanding that we could have. However, Maurice Wiles argues strongly that the analogy is simply not well enough

founded to be acceptable:

> "...the understanding of divine agency offered [by Farrer] is so distantly analogical and so unrelated to the causal story that we tell of the happening of events, that we appear to be left without even a direction in which to look to give intelligibility to the concept of particular divine actions of the kind that he affirms."[13]

The judgment seems to be sound. The actions of an infinite God will no doubt never be understood by us; perhaps even at best they will be made only plausible by analogy. However, it is difficult to attach meaning to an analogy which gives to the same action two different but simultaneous motives; indeed, it does not seem to be fully analogous to anything at all in our experience. The only similar situations of which one can think involve one agent overruling another in some respect, or one agent expressly professing obedience to another. Neither of these things can form a part of Farrer's picture of double agency. Double agency may be a good starting point for further theological investigation, but it does not seem to present an adequate end point.

Farrer's view continues to be attractive to many writers, amongst whom is Vernon White. He claims that the obscurity of the causal joint cannot be a problem to us if we can,

> "accept in human experience the hidden causal efficacy of human intention in physical action without knowing its precise causal modality."[14]

Whether we can accept this is indeed a crucial question, to which we shall return at some length when we consider the mind-brain problem[15]. The comment is of interest here, however, because of its tacit admission, which Farrer perhaps would not have allowed, that the answer to a properly scientific question (the causal modality of human intention) is of relevance to some aspects at least of this concept of divine action. If scientific insight may be gained into this modality, then part of those foundations of double agency defended by White are undermined, since no longer would human intention be an example of a hidden causal efficacy.

The conception of the causal joint between God and his creation is critical. Another theologian who is content to leave the causal joint out of view, but in a rather different fashion, is Rudolf Bultmann, to whom we turn next.

(c) Rudolf Bultmann and existentialism

If it is suspected that secondary causation and double agency have weaknesses either in the denial to creatures of free agency or through incoherence in attributing two parallel agencies to one event, these are not problems with Rudolf Bultmann's understanding of divine activity. Such problems stem from the attempt to give some parity between the world experienced as a unity in itself with a real measure of autonomy, and the world experienced as the arena for the direct, saving activity of God. Bultmann's approach is somewhat different: rather than holding these two aspects in tension, Bultmann first allows that the scientific description of the world is in all respects valid and complete. He then argues, however, that there is a circumscribed arena in which God acts, namely through the addressing and challenging of humankind in its existential awareness.

Bultmann believed that existentialism is required as the basis of a modern biblical hermeneutic, as will be reflected below. For some, this mixture of existentialism and Christianity is anathema, most especially when an allegedly secular philosophy becomes the interpretive key to the divine revelation of the Gospel. In our review of Bultmann's thought, we cannot enter these larger questions about the adequacy or otherwise of existentialism, which would take us far from our immediate concerns. Instead, the question which interests us is whether, having assumed for argument's sake the acceptability of an existentialist interpretation, Bultmann's description of divine activity does indeed free us as claimed from problems associated with a scientific outlook. If Bultmann's model is workable, it would be the next step in our enquiry to consider whether his programme is religiously adequate. In fact, we will conclude that Bultmann's conception does not in any case fully overcome the problems in understanding God's activity.

Existentialism is perhaps better described as a style of philosophy rather than one particular philosophy, since it encompasses a group of people too diverse and individual to form one school of thought. However, the originator of existentialism is commonly regarded to be Soren Kierkegaard in the nineteenth-century. His was the aphorism, "truth is subjectivity," which marks a reaction against

Cartesian rationalism and empiricism, but is not to be taken as an affirmation that anything goes. Rather, Kierkegaard's protest was that philosophy had lost itself in a cul-de-sac by analysing objective knowledge whilst ignoring the human subject who discerned such knowledge. We only come to truth as individuals, Kierkegaard argued, struggling to find truth and freedom in our unique existence. It is the nature of this individual existence, he claimed, that had been overlooked by philosophy.

Martin Heidegger was one who developed this line of thinking and who was highly influential on Bultmann. Heidegger analysed human experience in terms of the limitations of "inauthentic" dehumanizing existence and the fulness of "authentic" existence, which Bultmann took over into Christian theology as life with and without faith in Christ:

> "And just this is what is meant by 'faith': to open ourselves freely to the future. Such faith is simultaneously obedience, because it is our turning away from ourselves, our surrendering all security, our renouncing any attempt to be acceptable, to gain our life, to trust in ourselves, and our resolving to trust solely in God who raises the dead (2 Cor. 1:19) and who calls into existence the things that do not exist (Rom. 4:17). It is radical submission to God, which expects everything from God and nothing from ourselves; and it is the release thereby given from everything in the world that can be disposed of, and hence the attitude of being free from the world, of freedom."[16]

Such an understanding of faith has many resonances beyond existentialism, stretching back to Luther and beyond[17], but Bultmann felt it important to stress its existential nature as a means of understanding the mythology of the New Testament. Earlier classical liberalism had tended to ignore the supernatural aspects of the New Testament as being misguided, credulous accretions to its central message. Bultmann understood that these supernatural episodes were integral to the texts and so could not be excised, whilst he was also clear that they could not be accepted as literally true in our modern world. Hence he embarked upon the programme which he termed demythologization, involving the interpretation of New Testament myth in terms of existentialism.

In doing so, Bultmann by no means took himself to be a revisionist in the manner of a number of contemporary theologians. Rather, he believed that he was merely uncovering the actual meaning

of the New Testament texts in a more precise and adequate language:

> "Mythological thinking, however, naively objectifies what is... beyond the world as though it were something within the world. Against its real intention it represents the transcendent as distant in space and as only quantitatively superior to human power. By contrast, demythologizing seeks to bring out myth's real intention to talk about our own authentic reality as human beings."[18]

Myth, which describes the world as open to the intervention of supernatural forces, is taken to be the opposite of scientific thinking, in which the world can be explained as a closed system[19]. Since, in Bultmann's view, scientific thinking cannot now be doubted, mythological thinking in its outward form is rendered unusable; only the existentialist truth it seeks to express remains of value.

If this is the case, the question arises whether Christianity is no more than a redundant version of existentialist philosophy. Bultmann recognizes the force of this question, but his answer is clear:

> "This, then, is the decisive point that distinguishes the New Testament from philosophy, Christian faith from 'natural' self-understanding: the New Testament talks and Christian faith knows about an act of God that first makes possible our submission, our faith, our love, our authentic life."[20]

As might be expected given Bultmann's antipathy to mythological thinking, this act of God is not the intervention of a supernatural power. Rather, Bultmann describes it as our coming to belief in the saving efficacy of the cross of Christ:

> "In fact, faith in the resurrection is nothing other than faith in the cross as the salvation event, as the cross of Christ..."
> "How do we come to believe in the cross as the salvation occurrence?
> "Here there seems to me to be only one answer: because it is proclaimed as such, because it is proclaimed with the resurrection. Christ the crucified and risen one encounters us in the word of proclamation, and no where else. And faith in this word is the true faith of Easter."[21]

And, as Bultmann wrote elsewhere,

> "to talk about God's act means to talk at the same time about my own existence... This event of being addressed, questioned, judged, and blessed by God here and now is what is meant by talk about the act of God."[22]

It is in such a way that Bultmann preserves the world described by science and history as a reality independent of any act

of God. Acts of God make an appearance in history only as mediated by those who have faith, but not directly; acts of God are to be known personally in a new existential awareness.

We have already commented that it is beyond our immediate concern whether such a view of the Christian faith is adequate. The point at issue is whether Bultmann's views are successful in allowing us to conceive of God's action in the world without conflict with the findings of scientific enquiry. Since the existentialist approach removes God's activity from the inanimate world, any criticisms will centre on the interaction of God and the individual. We shall consider two.

A first criticism concerns the subjectivity of faith so conceived. As Owen Thomas, in his survey of problems concerning God's activity, puts it: "Does God in fact act in the world, or is it only that faith sees the world *as if* God were acting?"[23] The target of this criticism is not entirely clear, however, since Bultmann would in any case deny that God acts directly in the outward world. If, however, the criticism is taken to refer to the subjectivity of faith itself, then indeed Bultmann freely admits that faith cannot defend itself from the charge that it is an illusion: by its nature it will always remain elusive. He writes:

> "To claim that faith cannot be proved is precisely its strength. To claim that faith could be proved would imply that God could be known and established outside of faith and thus put God on the same level as the available world that can be disposed of by an objectifying view."[24]

This appears to be an adequate response to the criticism. There can be no requirement that a theological system should be able to prove itself: surely the only requirement is that it should make coherent sense of the experience of a religious faith, one aspect of which is its lack of certainty. In this respect, Bultmann's theology does not fail.

A second objection is summarised by Thomas in two questions:

> "Is there any ontological difference between an event in which God is acting and one in which God is not acting? How can we conceive of an act of God which is real and yet which does not have any objective effect on the finite causal nexus?"[25]

Here we arrive at a conceptual difficulty with Bultmann's proposals. For he is convinced that science provides a full description of our

world:

> "The idea that divine action is unworldly or transcendent is preserved only if such action is represented not as something taking place *between* occurrences in the world but as something that takes place *in* them, in such a way that the closed continuum of worldly occurrences that presents itself to an objectifying view is left intact."[26]

But surely in actuality that continuum cannot be left entirely intact, for God's action shows itself in the life of those with faith, influencing their actions in a way they would not otherwise have been. So science, and in particular the science of history as Bultmann describes it, does not provide a full description of worldly events, for it is blind to the source of those actions motivated by faith.

To illustrate the issues involved, let us consider Frederick, a highly paid actuary who has been recently converted to the Christian faith. After much thought, he concludes that his faith is calling him to give up his work and luxurious lifestyle in order to devote himself to work amongst the world's poor, in which he becomes a well known and saintly figure. Some years later, Frederick's biography is written, which naturally pays attention to his decision to leave the world of the actuary. What account could a secular biography give? There appears to be two possibilities, if Bultmann's assumptions are correct.

First, the biographer may proffer a psychological explanation. Thus, Frederick was always uneasy about his wealth; the Christian faith increased his feelings of guilt; the social pressure of fellow Christians affected his perceptions; his home life was deeply unhappy. If the biography were well researched, perhaps this explanation could be conclusively defended as being true in the court of historical science. But, if we assume that Frederick's faith was God-given, no amount of evidence could alter the fact that the biography is false: the explanation has to include the item that God acted in Frederick's life, even should the other factors mentioned also be true. Thus we arrive at a position where there is conclusive evidence that the psychological explanation is true, but where faith nevertheless gives a different explanation which is also true. There is surely something perplexing about having two true, but different, explanations of the same event. We want to say that either God did act in Frederick's life, or he did not. Perhaps the one explanation is true for a scientist, the other for the Christian believer; but what explanation should

a scientist who is also a believer hold? The only alternative is to say that we must in principle remain agnostic about someone's true motivation, but that would itself undermine science's claim to provide a full explanation of the world.

A second approach the biographer may take is to try to avoid the above problems by allowing that Frederick had something named as "faith in God" as well as the other psychological motives and pressures. But, from the point of view of objective science, no content could be given to such faith, as Bultmann himself stresses. Faith would be no more than a term of ignorance to cover what would otherwise inescapably appear to be in some way arbitrary or inexplicable in Frederick's action; thus faith could not be judged as true or false within the biographical explanation. It would follow that the explanation was not complete.

In either case, we end up with a paradox: that the full scientific description of the causal continuum of the world is incapable, in the one case, of deciding the truth of its explanation, and, in the other case, of giving a full description. Perhaps the only way out of this dilemma is to allow that any fully human action whatsoever falls outside the bounds of scientific description and explanation, not only acts of God. Indeed, it seems from Bultmann's writing that he himself believed this:

> "It becomes clear from all this that the world loses its character as a closed continuum for my existential life, which is realized in decisions in face of encounters. Put differently, in faith the closed continuum presented (or produced) by objectifying thinking is sublated - not of course in the manner of mythological thinking, so that it is thought of as disrupted, but in such a way that it is sublated as a whole when I talk about God's act. Actually, it is already sublated when I talk about myself; for I myself, in my authentic being, am just as little to be seen and established within the world as is the act of God."[27]

It seems that existential experience, not simply acts of God, is excluded from the world of science. We may recall here the comment by Vernon White quoted above concerning Farrer's double agency, in which appeal is also made to the inscrutability of human intention to illustrate the conceivability of divine activity. If this lies at the heart also of Bultmann's ideas, then likewise their success depends on science's being incapable of understanding the human mind. That is

an issue to which we shall return; but it lessens considerably the attractiveness of Bultmann's thesis. His model of existential faith loses its full independence from science and the causal continuum which includes the human brain, which was its motivation; rather, it needs to make the assertion that the human agent is independent of physical constraint. Existentialist faith becomes an analogy in which God is only free to act insofar as a human agent is free from scientific explanation. That a human agent is thus free is a case which needs to be argued, not assumed.

(d) Maurice Wiles

The proposals of the theologians we have considered so far each attempts to make divine agency plausible by having God's activity running in some sense parallel to events in our world, whether or not acting beyond the confines of the human agent. Maurice Wiles rejects this understanding of God's activity and finds himself constrained to place a greater distance between the divine and the human, at least in terms of divine and human activity, in that divine activity is for him a constant in our world to which humans respond in their various ways, rather than a temporal activity shadowing worldly events. He does so by speaking of the whole of creation as one act of God, rather than many. In such a way, Wiles attempts to take full account of our experience of the world as regularly ordered, as we noted at the beginning of this chapter.

When we discussed Bultmann's writing above, it was stressed that we were not primarily concerned to judge his theology, but the coherence of his views concerning the causal influence of God in the world. In the same way, our present interest in Wiles springs from his conception of God's actual interaction with creation rather than the larger question of the adequacy of his theology. We start, however, by sketching the outline of his thought.

For Wiles, God is decisively outside creation, which he created *ex nihilo*[28]. However, whilst affirming that God is never affected by forces or events from outside the sphere of his own influence, God is yet passible[29]. Wiles' argument for this arises from moral considerations which play an important role in his writings. He

is in favour of the free-will defence against the problem of evil, but believes that care must nevertheless be taken to acquit God of any evil himself:

> "If God is 'responsible' for evil, in however modified a sense, because he has taken the risk of creating a world in which it was highly likely, or even logically bound, to emerge, then there are strong moral objections to any view of God which regards him as immune from the damaging consequences of that evil."[30]

It is this same concern for morality which leads Wiles along a path away from any publicly recognisable direct divine action at all. He argues that since God did not intervene in Auschwitz, for instance, this must imply that God has chosen never to intervene in our world. If he did so on some lesser occasion, he would be guilty of not intervening to prevent the greater evil. Having given the creation a measure of freedom, God has no choice but to allow it full freedom if he himself is not to become culpable for the evil of its sufferings.

It is this aspect of God's standing back from creation in activity, if not through impassibility, that Wiles summarises through his insistence that there is only one overarching act of God, worked out through the history of creation[31].

With such an outlook, the question arises exactly how God can be said to influence his creation at all if he may not intimately control the ongoing progress of his creation's history. Wiles himself specifically rejects four possibilities[32]. First, the regularity of physical laws precludes our speaking of the evolutionary emergence of new life as being an act of God. Secondly, the occurrence of the miraculous is denied as having insufficient grounds. Thirdly, as was noted above, Wiles rejects the double agency favoured by Farrer. Finally, the case of someone who freely seeks God's grace to achieve a specific purpose is also rejected as an act of God, through fear that supernatural grace might then subsume human freedom.

In place of these active interventions, Wiles turns instead to the basic religious experience of responding to God. Such responsiveness spreads through human society as one believer evokes a response in another:

> "And since the quality of life in them to which those others will respond was itself grounded in responsiveness to the divine action, we may rightly speak of the events of their lives as acts of God in a special sense towards those

of us who are influenced by them...

> "...what we are doing is avoiding the error of thinking that we can ever describe divine action in any other context than that of its experienced response."[33]

Thus, in order to understand the point of interaction between God and creation, we must turn our attention to the human mind in which a response to God is formed. In particular, we turn to the consideration of prayer, the context in which a human religious response is most powerfully elicited.

As we may now expect, Wiles does not see in prayer the occasion of an infusion of divine power:

> "Praying to God for enlightenment may suggest that we are looking for a way to understanding that bypasses the normal critical procedures... that kind of interpretation is to be firmly rejected."[34]

However, shortly afterwards, Wiles goes on to write:

> "Such recognition, and very partial realization, of God's purpose as the world has seen in the past have been primarily forwarded by those who have used their God-given potential to open themselves to and identify their own goals with what they have grasped of the will of God. In the language of process theology, they have responded to the lure of the divine love available to them..."[35]

There might appear to be a tension between these two statements, since it is difficult to imagine how one may grasp the will of God without some sort of divine intervention in the course of human history. Earlier, Wiles had written:

> "We are not looking for a divine causation that can be neatly fitted in as a missing factor within our existing historical or physical accounts; that would be to treat God as just one more causal agent alongside others in the world."[36]

But if God is not such a causal agent, in some sense however qualified, then it would appear that one could never speak of grasping his will, since nothing on earth could be known to be directly related to his will. At most one could observe the existence of the world in which love is an important experience, say, but that would not amount to knowing God's will. If God does not act directly, we cannot claim to know whether love or hate the more closely agrees with his will: God would be disconnected from the universe. As Vernon White writes on this point:

> "Just how does God present a goal to his creatures in a non-empirical way? At what point does the activity of pre-

> senting a goal to a creature imply after all some 'efficient' causation?"[37]

Yet, upon a closer reading of Wiles, it is not clear that these criticisms are entirely just. For, although Wiles does not want God to be a causal agent amongst others in our world, yet it appears that he does not divorce God entirely from playing a role in one's consciousness. In *God's Action in the World* this is hinted, when Wiles considers the argument that a change in the weather would involve no less of a crude intervention by God than a psychological change induced, say, by prayer. Wiles responds,

> "[this] conclusion does not follow from the fact that psychological changes may always involve concomitant changes in the brain circuits; [the] argument would only be valid if we were to hold a false form of physical determinism according to which psychological changes could only be brought about by a prior modification of the brain circuits."[38]

Wiles then goes on, however, to agree with the substantive point that direct psychological change cannot be brought about by God without violating our freedom. On the validity of the counter argument concerning brain circuits, we shall have more to say in chapter five. The point we note here is that Wiles seemingly is not troubled by the notion that there may be a point of direct communication with God within our consciousness. He only argues that we must be careful that such interaction does not undermine our freedom. This is then the key to understanding Wiles' other statements on the nature of divine action. In particular, it would surely be needed to be assumed if the following comments are to be comprehended:

> "I have stressed a number of strands that constitute the indispensable background conditions of any particular experience of grace: God as the ultimate source of the conditions in which our lives are set; the availability of an awareness of his purpose of love as a source of guidance for our lives; the ways in which that love, having been apprehended and responded to in the past, is accessible to us now in such forms as the writings of the saints and the sacraments of the church."[39]
>
> "[In our prayers for grace,] we are involved in bringing to special awareness the fact of the presence to us of the God whose will we are seeking."[40]

It is tempting to accuse Wiles of deism, but that would not be quite fair. The essence of deism is a reliance upon the cosmological argument for the existence of God; if that fails, there is then no means of

speaking about God at all, since there is no other route to detect God's presence in our world. Although he remains slightly ambiguous on the point, Wiles does allow for a direct awareness of God's purposes of love, mediated through our consciousness. In a scientific analogy, Wiles apparently conceives of God's presence as an omnipresent field to which we respond. His concerns are not those of the deist who conceives of the universe as a perfect machine, but those of the theodicist. God has given the world freedom, and God should not be implicated in the world's evil, but he nevertheless assures it of his presence.

In terms of the causal joint between God and his world, the conclusions reached by Wiles appear to be similar to those implied by Bultmann. Although Bultmann can speak of God addressing us in a way which Wiles would deny, the arena for communication remains essentially the same, namely our own awareness. Thus, as with Bultmann, Wiles' account requires a point of interaction between the causal nexus of the world and the divine. This Wiles concedes, but argues as we have noted that such interaction does not violate our understanding of the regularity of our world. This proposition we shall consider in more detail in chapter five.

(e) Conclusion

In this chapter we have reviewed some of the ways in which theologians have proposed that God's action in our world may be understood without doing violence to the patterns of regular causation revealed to us by science. However, none of these models has been without severe problems, or without its own assumptions about the limits of scientific description, particularly in relation to the human consciousness.

We have argued that Aquinas' description of secondary causes, whilst suggestive of an independent world under God's oversight, nevertheless was not intended to grant that measure of autonomy for which we might look. Secondary causes form part of Aquinas' reconciliation of God's graciousness in allowing his creation a real dignity, with his insistence that even what God arranges contingently should always come to pass. We shall consider such theological

determinism further in chapter four; for the present we merely note that secondary causation is not in any case an uncomplicated means of understanding God's action independently from science.

Austin Farrer gives an attractive account of double agency which apparently makes no demands upon the scientific world-view whilst also allowing God an unlimited freedom to act. The causal joint between the two spheres of activity will, in Farrer's view, for ever remain hidden. This understanding of divine agency founders, however, upon trying to make sense of how two agencies can simultaneously be present in one event. In the absence of an adequate analogy, we suspect that the model must be discounted, at least without further development.

Although considering the problem of God's action from very different angles[41], Rudolf Bultmann and Maurice Wiles appear to make similar assumptions in the matter of the exact point at which humanity becomes aware of God. Each allows the human consciousness a freedom from physical restraint sufficient for God to make himself present. Indeed, in the practical outworking of their theology, Bultmann and Wiles are surely very close to one another. We have commented, however, that the assumption of the freedom of the human consciousness is itself not one that can be made independently from modern science. Indeed, this is one of the points of greatest controversy in contemporary science and philosophy.

In the next chapter, we therefore turn to an investigation of the nature of science, before examining more closely the intersection of science and theology relevant to our concepts of divine interaction.

Chapter 3: The Interpretation of Modern Science

Before we proceed in the following chapters to consider models of divine action in the light of modern science, in this chapter we shall concentrate upon the philosophy of science. In recent times, as we shall see, influential movements in the philosophy of science have suggested that scientific theories cannot be taken to be hard and fast representations of physical reality. Some suggest that science cannot be understood to be in any way a direct window upon our world, but merely a human construct. If this is the case, then science would become something of a straw man so far as conceiving divine action is concerned. For science could be in no position to place real constraints upon the ways in which we understand God to act, unless we can be reasonably assured that scientific findings faithfully reflect some external reality. In fact, we shall argue that science does describe such a reality and must therefore be taken seriously in considering divine action.

(a) Scientific induction and causation

Perhaps it is arguable that the more profound intellectual change at the time of the Enlightenment was not a greater confidence in empiricism, but a greater confidence in inductive proof. Stemming from Greek philosophy, medieval thinking set store by deductive reasoning as the gateway to truth. That way of reasoning was not available to natural philosophers who had to draw conclusions from a limited number of observations, generalizing these particulars into universal statements. The classical treatment of the new scientific method was formulated by Francis Bacon in his *Novum Organum* of 1620, which came to be known as Baconian induction. Here was laid out the ideal of eliminating human subjectivity by means of tabulating all the available data, both positive and negative, and comparing every case in order to arrive at a true theory[1]. Yet it was the methods and

the limits of reliability of such induction which was to stimulate debate up to the present time.

On the one hand the fact that there is little formal justification for induction continues to prompt debate. Bertrand Russell for example commented that the fowl which inductively expects to be fed each succeeding day will be surprised the day it is killed to be eaten. More recently, Nelson Goodman has proposed a "new riddle of induction" which points out also that how the future is predicted inductively depends crucially upon which particular regularities of the past are taken to be significant[2]. The problem is not merely whether we are justified in expecting an event to recur, but how we can know in which ways to extrapolate to future events. To avoid such problems, Karl Popper developed a theory of science he claimed avoided induction altogether, based upon the notion that a scientific theory is one capable of empirical falsification[3]. His thesis is that falsification does not involve any element of induction; all we need, and in practice only ever have, is a collection of provisional theories waiting to be disproved. However, it is doubtful that Popper's intention succeeds: a good theory is reckoned by him to be one which is readily falsifiable by predicting unexpected experimental consequences. Yet the induction he seeks to banish has then returned in the need to determine what exactly would have been expected in any future experiment if the unexpected is then to be recognised.

These are all serious problems for the philosophy of science and for determining what science can reliably tell us. A dominant problem, however, was raised in an extreme form by Hume. In his treatment of causality, Hume shows the inherent limits of induction to powerful effect: in cases where deduction is possible, we have the analytical power to cut to the core of a phenomenon; in the case of induction we are in a sense confined to the externals of phenomena, allowing us to make predictions at best, but not giving us a weighty means to probe further. It is precisely where induction is weakest - in accessing the essential nature of a substance - that the claims of a modern scientific outlook become strongest. In popular terms, the question which lies at the heart of God's interaction with the world is whether science has shown the cause of any event to be always nothing more than another cause scientifically described. In the common

view, science is concerned with cause; thus it is to cause that we should turn.

The notion of cause and effect is plagued with difficulties for two sets of reasons. First, cause and effect are not primarily technical terms in our language, but are used informally in different contexts. They therefore have a large range of application, from inanimate mechanical systems to the apportioning of blame in courts of law. Thus it is not surprising to find that philosophical discussion is clouded by a lack of agreement as to what should be the fundamental role of the word "cause". For instance, R.G. Collingwood argued that the primary sense of cause should be something used by a human to bring about an effect in nature[4]. On the other hand, Bertrand Russell wrote that it is, "the analogy with human volition which makes the conception of cause such a fruitful source of fallacies."[5] In discussing cause and effect, it is not clear whether different writers are actually considering quite the same thing.

The second set of reasons making the analysis of the concept of cause and effect difficult involves the issues which become linked to it. As we have suggested above, a closely related topic is the validity of induction from empirical data. Let us therefore move towards presenting David Hume's views, whose writings remain the classical treatment of the topic, whether to be applauded or denigrated.

In the Middle Ages and earlier, the term "cause" would hardly be recognised by someone brought up in an empiricist environment. "Cause" was used in Greek philosophy as a term in the understanding of the way in which states of various entities may change, whilst maintaining their unity of substance. For instance, Plato proposed the existence of two realms: the real, eternal world of permanence and our world of mutability, although their inter-relationship is not always clear[6]. The cause, or explanation, of any aspect of our changeable world was to be found in the ideal, eternal form towards which that aspect strives.

It is against such a background that Aristotle differentiated "cause" into four types[7]: the material cause (that in which a change is wrought); the formal cause (that into which the entity is changed); the efficient cause (that which brings about the change) and the final

cause (the purpose for which the change is brought about). In the modern debate of cause and effect, cause is now identified only with Aristotle's efficient cause; the former two types of cause are of largely historical interest only, whereas final cause has until very recently been out of favour in the discussion in natural science. It was Descartes in particular who first insisted that final causes had no role to play in science[8].

Given that much of the metaphysical background in which the concept of causation developed belongs to another era of history, it is not surprising that some have sought to reject causation as being of any relevance whatsoever to modern science and thought. Thus, Russell wrote:

> "The law of causality, I believe, like much that passes muster among philosophers, is a relic of a bygone age, surviving, like the monarchy, only because it is erroneously supposed to do no harm."[9]

Russell's contention was that in any advanced science, such as physics, nothing in its methodology requires the appearance of the notion of cause. Yet even were we to allow that cause makes no appearance in the formalism of science, it remains part of the everyday vocabulary of scientists. Thus, scientists still ask questions such as, "What causes cancer?" or "What causes the sun-spot cycle to be eleven years?"

The move away from considering cause and effect as fundamental to the project of science was decisively begun by David Hume in his rejection of the notion of "power". As previously mentioned, the idea of cause had been invoked to explain how change occurred and so philosophers associated with "cause" a power to bring about that change. Thus animals could be described as self-moved and God, as the cause of the world, was thought to be all powerful. Causes were not only followed by their effects, they in some sense necessitated their effects by the exercise of power. Accepting this, it is clear that cause and effect would lie at the heart of any description of the world.

Hume attacked this view of causation, however, both by denying that "necessary" could validly so be used and by denying that any power supposedly involved could ever be observed. Let us first consider Hume's attack on the notion of necessity in cause and

effect. He wrote:

> "The contrary of every matter of fact is still possible; because it can never imply a contradiction, and is conceived by the mind with the same facility and distinctness, as if ever so conformable to reality. *That the sun will not rise tomorrow* is no less intelligible a proposition, and implies no more contradiction, than the affirmation, *that it will rise*. We should in vain, therefore, attempt to demonstrate its falsehood."[10]

Hume regards necessary as implying logical necessity and invites us to contrast the sort of necessity we may envisage in natural processes with that in a more formal logic. Thus it seems correct to say that whereas it is impossible to conceive something which is logically or mathematically necessary being false (e.g. imagining a square circle), this is not the case with natural phenomena. The implication is that necessity is not a concept validly used of causation; let us allow this plausible argument for the present.

The second element in Hume's argument from scepticism affirms that the supposed power by which a cause brings about its effect is never directly observed:

> "When we look about us towards external objects, and consider the operation of causes, we are never able, in a single instance, to discover any power or necessary connection; any quality, which binds the effect to the cause, and renders the one an infallible consequence of the other. We only find, that the one does actually, in fact, follow the other. The impulse of one billiard ball is attended with motion in the second. This is the whole that appears to the *outward* senses. The mind feels no sentiment or *inward* impression from this succession of objects: Consequently, there is not, in any single, particular instance of cause and effect, any thing which can suggest the idea of power or necessary connection."[11]

For Hume, the idea that a cause in any sense necessitates its effect is merely a habit of thought on our part, a product of our imagination. Outwardly, all that is presented to us are several instances of two events which are conjoined, which gives rise to our expectation that they will always be conjoined in the future.

An immediate difficulty with requiring a series of events before forming an idea of a causal connection is that no such series of events actually occurs. Every event in the world is unique: certainly if one includes the whole state of the universe at that time, and for all practical purposes even if one does not. Thus there is never

in fact a sequence of identical events which one can observe. Hume tries to escape this difficulty by making his definition of cause to be,

> "an object, followed by another, and where all the objects similar to the first are followed by objects similar to the second."[12]

It is doubtful whether this is sufficient for Hume's argument, since one is led to question in which respects sets of events must be similar in order to count as an example of the same cause and effect. For instance, imagine striking three different matches: one is dry, one is damp and another is dry but decorated by miniature carving in the wood. The first match lights, but the others do not: how could one be justified in holding our "common sense" view that the second match was not similar to the first in the relevant respect of being dry, whilst the third match was similar to the first, rejecting the cause of its not striking as being due to its carving? Nevertheless, let us assume that the above difficulty can somehow be overcome; there are possibly two greater, though related, difficulties.

First, if one is to deny any possibility of observing a necessary connection between cause and effect, but simply their constant conjunction, then a great number of counter-intuitive causes and effects must be allowed. A contemporary critic of Hume, Thomas Reid, pointed out that one would have to say that night caused day (and vice versa). Another popular example is that of the factory hooters which sounded at noon across the country sending workers for their lunches. But surely a hooter in Newcastle is not said to cause workers in Bristol to go for lunch, although there is a constant conjunction?

Secondly, it is not clear that Hume's formulation of the understanding of causation is any advance in practice beyond a view which includes the notion of necessity. If the newly defined concept is to retain any utility, one must argue inductively that what has been observed in the past, it is reasonable to believe of the future. But in arguing that what has previously been identified as a cause and effect will hold good in the future, one is doing no more than assuming some sort of necessary connection which will therefore always be observed. In the constant conjunction view of cause and effect, all one may observe is a universal of fact: i.e., that as a matter of fact, in all observed cases of cause A, then effect B has followed.

But does not the notion of causality involve more than simply a mere generality which can never be projected into the future?

On this point, Hume himself seems to be inconsistent. Following the definition of cause quoted above, he adds:

> "Or in other words where, if the first object had not been, the second never had existed."[13]

This is by no means the equivalent of the first statement of his definition, because if all one can observe is a sequence of events only named later as cause and effect by their observer, then one cannot deduce anything from the presence or absence of the so-called cause. Such a statement of the form, "If A were B, it would be C" is said to be an 'unfulfilled hypothetical'. It is statements of this form which lay bare to what one is committed by Hume's formulation.

Consider the statement, 'All the flowers in my garden are blue.' From this, is it valid to say that, 'If a certain flower were in my garden (which it is not), then it would be blue.'? This unfulfilled hypothetical would be valid if the first statement from which it derives is necessary, but invalid if that first statement is contingent. Applying this test to Hume's definition of cause, does the observation that, 'Heavy objects fall to the ground' enable one to say that, 'If I were to throw a plant pot out of the window (which I will not), then it would fall to the ground'? Or, to take a more advanced example, Newton's first law states that an object continues in its state of rest or uniform motion unless acted upon by an external force. Since all objects in the universe are as a matter of fact acted upon by external forces, this first law is thus an unfulfilled hypothetical. Is Newton's first law therefore merely something 'he feels ... in his imagination'? Despite the inconsistency noted above, it seems that Hume would have to answer positively.

In his consideration of causation, Hume has shown clearly the limits of induction and thus empiricism. Few people (and, it seems, Hume himself) find it easy to believe that causal connection cannot be known as anything more than the constant conjunction of events. But if we were to accept Hume's sceptical premise that we know only what we are able to observe by our senses, then it seems difficult to deny that his conclusions follow. To this day, it seems that there has been no single adequate response to Hume's challenge; at any rate, there is

no agreed response.

Philosophically a number of proposals have been made against such scepticism, amongst them that of Kant. Kant allows the world to be causally connected, but that world is the one of human experience, not the world in itself. This does not lead to solipsism because the structure of our experience is not merely dependent upon any particular individual, but derives from the nature of a human being. Our very minds are pre-structured to experience the world in certain ways[14]. Kant's views proved highly influential, feeding into the stream of German idealism; however, his writings have not been so important in the recent history of the philosophy of science which has fundamentally reacted against them. Thus, as we wish to clarify the problems for divine action which stem from a modern scientific view, we shall consider the influential response to Humean scepticism of the positivists.

(b) Positivism

Positivism originated with the publication of *Positive Philosophy* by Auguste Comte in 1830. In the light of the involved and apparently unfruitful philosophical debate occasioned by writings such as those of Kant, positivism deliberately rejected in principle any claims to metaphysical insight. Furthermore, positivism claims that in fact an adequate scientific explanation of any phenomenon can never be more than merely the best description of it. Thus it was that Russell, standing in the line of such philosophy, altogether rejected causality as a scientific notion, as noted above.

There have been many exponents of positivism, but one of the foremost was Ernst Mach. In his *The Science of Mechanics* (1883), Mach set out the positivist point of view:

> "It is the object of science to replace, or save, experiences, by the reproduction and anticipation of facts in thought. Memory is handier than experience, and often answers the same purpose. This economical office of science, which fills its whole life, is apparent at first glance; and with its full recognition all mysticism in science disappears...
>
> "There is no cause or effect in nature; nature has but an individual existence; nature simply *is*. Recurrences of like cases... exist but in the abstraction we perform for the

purpose of mentally reproducing the facts."[15]

So it is that a positivist sees science as a short-hand for experience, useful for reminding us of past experiences and anticipating future experiences. Truth is found only in the individual experiments; scientific theory is no more than an *aide memoire*, and has no independent claim to truth. Indeed, in the full development of logical positivism, a verbal concept is denied any meaning at all, independent from experimental verification.

If the positivist scheme is accepted, it has an interesting implication for us. Positivists have tended to exclude terms such as God from their vocabulary as having no empirical meaning. But a positivist view of science would actually make divine action in the world more easily defensible. For if science can have nothing to say about the nature of physical processes beyond what has been observed to occur, then it has no means of declaring which interactions are possible or impossible. For instance, water has never been observed to turn to wine (save for one occasion?). However, if the theory that water never changes to wine is simply equivalent to the observation that the transformation has not (regularly) been observed, then the theory provides no reason to prevent such an occurrence in the future, or on some occasion in the past. Only if a theory declares that causally no such event could happen, would the claim be contradicted that water has on occasion been turned to wine.

But is a positivist outlook sustainable? It seems not, for there are probably insurmountable difficulties. These problems arise once again from the threat of scepticism. Any belief that the only knowledge available to us is gained via the senses must invest the senses with absolute reliability. If such reliability is not guaranteed, then neither is the knowledge gained. Given positivism's declared disdain of metaphysics, it has few resources available to it for such a guarantee; yet Mach and his followers did not wish to be forced into scepticism themselves. Their response to the challenge was to follow George Berkeley in formulating so-called phenomenalism. Instead of proposing that mind has perceptions of some reality "out there", phenomenalism regards reality as being the perceiving mind together with its perceptions. This whole forms reality, to be taken without further analysis.

Having made such a move, however, other problems arise for the positivist. The world is not one mind (although Berkeley was able to claim that it is within the mind of God), but it consists of many isolated individuals. If each individual constitutes its own reality, how can we know that those realities correspond with one another? We have merely sharpened the problem of scepticism into the related problem of relativism. We seem to have no means of being certain either that perceptions are uniform, to be repeated in the future, or that they are universal, to be the same for different observers. Science is founded upon experiments which are supposed to be repeatable with the same outcomes. Any theory of science would seem to need to embrace some understanding of that constancy, whereas positivism eschews any such possibility.

Another problem for positivism lies in the status it accords to theory. Theories, as we have seen for Mach, are nothing more than a short-hand for experience. It must therefore be possible to decide between theories experimentally, by appealing to the facts of the situation: for a positivist, there is nothing else but empirical fact to which to appeal. Yet Irving Copi, amongst others, has doubts that such a simple appeal is possible[16]. He considers the example of an experiment to prove whether the earth is flat or curved by observing a ship receding on the horizon. One might think that if it apparently sinks beneath the skyline, then this indicates unambiguously a curvature to the sea's surface. However, the same effect would be observed if light travelled not in straight lines, but in sagging curves. As the ship's distance increased, light from its hull would at a certain point then curve downwards sufficiently to become obstructed by the surface of the ocean, making it seem to an observer to disappear before the masts. Thus, which theory the observer already holds about the propagation of light waves crucially affects what he or she believes the experiment to have demonstrated. There is then no such thing as the theory-free observation which positivism needs to affirm.

(c) Logical empiricism

Positivism retains influence, but it is nowadays as likely to

be found incorporated into another model of scientific explanation proposed by the so-called logical empiricists. In the aftermath of logical positivism, Hempel and others became convinced of the need to relate scientific theory to experience in a more secure fashion than the verification principle had allowed. This principle stated that any term or proposition can be made meaningful only through a specified experimental or observational procedure, otherwise it is either meaningless or a tautology. But the problem with such a principle was that it made uncertain the status of general laws in science, which being generalisations could not be experimentally verified. Hence the logical empiricists saw a need to bring laws into a rigorous understanding of scientific explanation and made use of the so-called covering law model, which has now been a focus of debate for the last four decades[17]. Although various authors have favoured this scheme of scientific explanation, including in the past J.S. Mill in his *System of Logic* (1843), recent debate has centred upon the paper published by Carl Hempel and Paul Oppenheim in 1948[18].

The central element of the covering law model is the belief that scientific explanation is always in the nature of a logical argument. Furthermore, this argument is deductive in form, deriving the occurrence of the particular experience under scrutiny from a more general set of "covering laws". Thus the theory is alternatively described as deductive-nomological.

The proposed structure of any scientific explanation consists of two parts: the explanandum and the explanans. The former is a sentence which describes the phenomenon in question and which must be logically entailed by the explanans. The latter is the class of sentences which are adduced to account for the phenomenon, divided into sentences which state specific antecedent conditions and sentences which represent general laws. The explanans must contain at least one general law essentially required for the derivation of the explanandum. Thus the form of such an argument is:

Antecedent conditions
General laws

Explanandum

To illustrate this form of explanation, Hempel and Oppenheim consider the phenomenon of a rowing boat's oar appearing to bend as it enters the water. Here the general laws needed are those of refraction and the property that water is an optically denser medium than air, whilst the antecedent conditions include those that the oar is partially in water, partially in air and that an oar is practically a straight piece of wood. From this explanans can be deduced the explanandum that the oar will appear bent.

As a description of the scientific ideal, the covering law model has the advantage of being close to science as it is practised, at least in the case of physics. The scientist aims to discover more and more general laws under which greater numbers of phenomena become explicable. Indeed, this theory of explanation became the consensus view of philosophers of science during the 1950's and 1960's, being labelled as the received view. One of its virtues in gaining this consensus was that it returned a form of necessity into explanation from the wilderness into which Hume had sent it. The antecedent conditions in a logical sense necessitated the explanandum. Yet it could still be supported by positivists who might point out that the general laws themselves needed to be no more than generalisations from observed regularities. Hempel and Oppenheim themselves took this view.

The deductive-nomological model is not, however, without its difficulties. Some of these are technical in nature, arising from its claim to be a complete presentation of the logical structure of explanation. Other difficulties are, perhaps, of a more profound nature.

The first group of difficulties concern the nature of explanation. Hempel and Oppenheim insist that,

> "...scientific research in its various branches strives to go beyond a mere description of its subject matter by providing an explanation of the phenomena it investigates."[19]

But it proves unclear that the received view has in fact moved beyond a form of positivistic description. Michael Scriven, for example, argues that the role of general laws in the logical empiricists' scheme is a red herring: mention of such laws sometimes only justifies the explanation, but does not form part of it[20]. He gives the example of someone knocking over an ink bottle whilst reaching for a ciga-

rette. The explanation for the resultant ink stain on the carpet does not need to involve the statement of Newton's laws; it is simply that the ink bottle was knocked over.

Furthermore, scientific explanations seem to have an asymmetry which logical arguments do not. An example of this is considered by Sylvain Bromberger[21]. Given a flagpole of a certain height standing on level ground and given that the sun is at a certain elevation in a clear sky, then the length of the flagpole's shadow can be deduced, assuming the law of the rectilinear propagation of light. Yet the covering law model of explanation equally could be used to deduce the height of the flagpole given the length of its shadow, which few would wish to concede could actually be called an explanation of the flagpole's height.

Functional explanation provides another area of difficulty. For instance, a functional explanation is constituted by the statement that the role of the heart in a vertebrate is to circulate blood through the body. Is this type of explanation valid? Hempel argued that it is not, for the following reason[22]. It is possible to assert that if the heart beat exists and the vertebrate is in normal conditions, then the system which is the vertebrate will function normally. However, if the deductive-nomological model is to be followed, we would have to deduce from the prevalent conditions and from the fact that the living system is operating normally, the conclusion that the heart beat is necessary. But this cannot be done, for we do not know that some item other than a heart beat could equally well have achieved the function of circulating blood. The demand of the covering law model that the explanandum is deducible from the explanans remains unmet.

The antipathy of logical empiricism to functional explanation is not unexpected, since such philosophy is suspicious of anything which approaches teleology. So if it were to be found that teleological and functional explanations were both needed and valid in science, this would be a serious breach in the logical empiricists' case. Yet it does appear that the covering law model is severely restrictive in what it allows as an explanation. As Wesley Salmon comments:

> "Hempel's analysis of functions is, I think, logically impeccable... But I have often noticed that, in philosophy as well as other human endeavours, one person's counter-

> example is another's *modus ponens*. Hempel concludes from his discussion that functional analysis cannot qualify as an admissible type of explanation; at best, it has heuristic value. Others, myself included, would take the moral to be that, since functional explanations play a legitimate scientific role, explanations cannot always be arguments of the sorts endorsed by the received view."[23]

This group of criticisms may lead us to conclude that the deductive-nomological model has fundamental problems with its notion of explanation. On one side, some of its explanations appear to be little more than descriptions; on the other, the form of argument to the explanandum appears in many cases to be rather artificial and too restrictive.

The second area of difficulty arises with the extension of the covering law model to include statistical scientific explanation. Hempel and Oppenheim acknowledged from the outset that not all explanation is deductive-nomological by nature, but it was not until 1965 that Hempel produced a final scheme for dealing with probabilistic phenomena[24]. He proposed that statistical explanation should be dealt with inductively, so giving the name, the inductive-statistical model. Its outline is similar to the deductive-nomological model, except now the explanandum is to be expected with a high degree of inductive probability rather than with certainty; the general laws in the explanans are accordingly to be statistical in nature.

However, having the explanandum inductively expected is not convincing. Consider a stochastic process, such as a machine which randomly selects balls upon which numbers are printed for a game of bingo. At the first draw of a ball, 90% of the numbers which could be selected do not end with the digit zero. It is therefore to be expected inductively that the first number called will not end in a zero; thus, if in an actual game this is so, we have an inductive-statistical explanation of the occurrence. Yet it would then seem artificial to say that, should the first number called in fact end in a zero, we have no explanation of this fact since it was not inductively to be expected: surely we understand the improbable outcome just as well as that which is probable. Statistical explanations intuitively remain valid even when the events they describe turn out to be statistically unlikely. This is contrary to Hempel's proposal.

We have discussed the covering-law model at some length,

both because it has been of major influence in the philosophy science and also since it reveals some important points regarding the nature of physical laws. First, the attempt to use general laws in an all-embracing scheme of scientific explanation appears to fail. There is a pluralism of explanation, which in particular includes a functional or teleological type. If there are general laws, they cannot be as simply interpreted as the nomological-deductive model suggests for their explanatory potential to be reaped. Secondly, if statistical laws exist, they pose severe problems for a covering-law type of model.

These considerations have led a number of philosophers to draw the conclusion that some form of causality must again be accorded to the world beyond the logical structure we happen to choose for our explanations. Explanations are more than sketches of our collective observations and have a deeper content. Such is the opinion, for example, of Salmon, a one-time supporter of the covering law model:

> "[I] maintain that explanations reveal the mechanisms, causal or other, that produces the facts we are trying to explain."[25]

We are therefore moved towards a realist account of science by the inability of other descriptions to lend sufficient weight to the conviction that, on the one hand, explanations actually uncover something about the world, and, on the other hand, that scientific explanation makes use of a whole range of explanatory forms, not simply those allowed by any particular model of science. However, a radically different understanding in science has been argued for influentially by Thomas Kuhn, which we shall first briefly mention.

(d) Kuhnian relativism

By studying the history of science, Kuhn has claimed that which scientific theories are accepted or rejected is largely determined by social pressures within the community of scientists[26]. During stable periods, scientists operate according to a largely unstated paradigm consisting of a mixture of theories, accepted procedures and experiments. Within this paradigm, much that goes on can be described as no more than problem solving. However, at certain times, revolutionary pressures in the scientific community overthrow

the current paradigm, replacing it by another. For instance, in the early twentieth century, Newtonian mechanics was overthrown by Einsteinian relativity. Importantly, Kuhn argued that any two paradigms are incommensurable: scientists working with different paradigms can be said not to inhabit the same world in their outlooks. Thus a relativism is introduced into scientific findings, although Kuhn in fact denies the label of relativist.

The view appears to be overstated, however: first, pressures for change build up over a period of time; secondly, the old paradigm is rarely fully overturned. For instance, Newtonian mechanics remains fully understood; in everyday terms, it is still our view of the world.

Kuhn's work is a reminder that the path of scientific progress is not entirely determined by rational considerations. Nevertheless, the scientific enterprise is more than a successful, but compromised, group activity in which the participants are limited by whichever paradigm currently holds sway. This is also the view of scientific realism.

(e) Scientific realism

A realist view of scientific explanation is of course open to criticism in all the ways available to Hume: in particular, it demands that reliable generalisations be made from limited observations of particulars. Perhaps the only adequate response to such a criticism is to point out that the available alternative accounts of science appear to undermine any meaningful explanation whatsoever. By making any explanation of an event equivalent to its description, they are ultimately sceptical; yet the last century has seen such progress in science, with feats of highly accurate prediction in quantum theory especially, that such scepticism can begin to seem nothing less than perverse.

This is not to suggest that the claims of science should be accepted at face value. Rather, it is to discount those theories of science which *a priori* do not accept that our deeper understanding of the physical nature of our universe may be advanced. We know now, for instance, the chemical basis by which genetic characteristics are translated from parent to child, which understanding itself derived

from the explication of the many other processes needed in its experimental determination. Such progress in understanding seems to me to be incomprehensible unless the trail of scientific investigation has actually engaged with some corresponding reality in the world.

It also suggests that, at first sight, so-called instrumentalism is too harsh an assessment of what we can claim to know. Instrumentalism contends that, whilst a scientific theory may lead to correct empirical conclusions, any terms in that theory which are not directly related to observation should not be regarded as having any ontological reference. Recently Bas van Fraassen has argued, for example, that all we are entitled to conclude is that things behave as if there were some unobserved entities, such as electrons or photons[27]. It is of no advantage, van Fraassen points out, to our ability to explain phenomena if all we can do is shift unexplained macroscopic regularities to unexplained microscopic regularities.

However, Salmon gives as an counter-example the many methods which exist for empirically determining Avogadro's number, the number of molecules in a mole of a gas. Because all these entirely different determinations agree, then there are surely good grounds for believing in the reality of Avogadro's number and of the molecules that it counts[28]. Caution is needed in dealing with theoretical entities, but what at one time is merely a hypothetical construct might eventually gain a sufficient variety of empirical backing to become accepted as actual. Although - or perhaps because - science is always corrigible, its advances are not simply illusory but may be substantiated.

Such a cautious but realist approach to science, known as critical realism, has been much advanced in recent years[29]. Some of the implications of critical realism will be worked through in the remainder of this thesis, but it is worth noting already that such a realism is not an easy option in the consideration of divine interaction. As was pointed out above, positivism is fundamentally agnostic concerning the reality beyond us and so actually grants freedom for God's action at a physical level. What we cannot in principle know, cannot be known to have been violated by God. But there is a further point to be made. Up until the 1940's or so, it was widely held, at any rate in philosophy, that science had no business to explain,

but only to describe. This was partly in reaction against the metaphysical claims of German idealism which wanted to imbue natural and historical processes with purpose. Critical realism marks a growing confidence that, on the contrary, science can teach not only that something happens, but why it comes to happen as well. This confidence finds expression, for instance, in the writings of Jacques Monod and Richard Dawkins, to whom we shall turn later. But this new scientific realism has little room for divine interaction since it views theory as providing a totally reliable map of reality: an interaction barred in science's theoretical outlook is also barred in reality.

The growth of realism is thus a mixed blessing regarding the easy formulation of analogies for the observable aspects of God's action in our world. The scientific method does indeed reveal an ordered world which operates causally according to law-like principles. A certain realism is appropriate in accepting the results of scientific enquiry, even though such realism remains critical and acknowledges that the scientific method is not above question. But the weakness in the scientific method, due to the limits of induction, is to be exploited carefully, if at all, in delineating divine activity. For the problem of induction has not proved to be fatal to science, but merely to be the sign of a limitation with which all rational enquiry has to contend. Critical realism acknowledges that scientific theory cannot be a straitjacket with which to inhibit God's activity; but it also demands that scientific insights be treated with utmost seriousness.

We see ourselves to be living in a world of regular order, even if not a world of mechanical determinism. In the next chapter we shall investigate whether that regularity may itself be theologically fruitful if linked to a theological determinism.

Chapter 4: Physical Law and Theological Determinism

In the previous chapter, we argued that science's view of a world of regular order needs to be taken seriously, forming the context in which divine action should be conceptualized. We had already suggested, in chapter two, that those attempts prove inadequate which try to understand God's interaction by entirely side-stepping issues of science. It seems one should explicitly relate science and theology within one system of thought; thus it might appear that one must look to the results of science itself to indicate possible modes of divine interaction. This we shall do in due course.

However, in this chapter we shall investigate a mediating position between looking for God's interaction within science and finding God's interaction outside science altogether. Such a position is founded upon the classical tradition of theological determinism, with the affirmation that such determinism is fully reflected in the regular natural order. That is not to say that such order must therefore be mechanically deterministic, which it indeed seems not to be. Rather, where natural laws are probabilistic in form, then we are merely committed to the proposition that God determines the outcome of each physical event without violating any such laws.

As a means of allowing some of the issues to emerge, we shall begin by considering theological determinism combined with a mechanistically determinist view of science, before also considering the introduction of scientific indeterminism. In fact, this is not in any case entirely an artificial procedure, for two reasons.

First, our universe is seen to be deterministic in a number of important respects. We look upon the natural world as essentially predictable and reliable: the sun will rise tomorrow; a swinging pendulum will continue to mark time steadily. Where there is unpredictability, such as in forecasting the weather, we consider this to be a sign of our ignorance and incompetence rather than a fundamental characteristic of our world. Radioactive atoms may decay at random,

but this is remote from our immediate experience; indeed, that is why random phenomena become so fascinating to us. Thus it is within this outward framework of predictability that we experience the divine. Of course, we should note that an exception to such predictability comes in our experience of the mental life; this will require more detailed discussion later.

Secondly, in the discussion of divine action, the contrast with determinism cannot be an indeterminism in the sense of utter randomness. God's action is presumably not random but highly purposeful, so that difficulties encountered in trying to discern divine action in a highly ordered universe will not necessarily be eased merely by introducing an element of randomness. The problem of a regular universe, we propose, is in seeing any transcendent meaning in events which themselves are known to be fixedly ordered. It would be equally difficult to find meaning in utter disorder.

In considering issues of theological determinism, we turn first to its classical exposition by Calvin before investigating whether or how such a theology may be combined with mechanical determinism.

(a) Calvin and determinism

Calvin is strongly deterministic, claiming that all that happens is the consequence of God's direct will from moment to moment. He does not uphold, however, mechanical determinism, by which we mean the belief that everything is determined as the consequence of fixed, essentially non-probabilistic natural laws.

Calvin's determinism stems from a strong view of God's omnipotence:

> "And, indeed, God claims omnipotence to himself and would have us acknowledge it, not such as the sophists imagine, vain, idle, and almost asleep, but vigilant, efficacious, operative, and engaged in continual action... applied in every single and particular movement."[1]

Such a strong view of theological determinism immediately raises questions of human freedom, especially regarding the freedom of the will. Free will encapsulates the notion that our decisions are entirely our own, arrived at privately beyond the inspection of others and not necessitated by any external cause. We are responsible for

our decisions precisely because they cannot be predicted, remaining unknown to others until we by our actions reveal them. William of Ockham, for instance, defined free will as,

> "that power whereby I can do diverse things indifferently and contingently, such that I can cause, or not cause, the same effect, when all conditions other than this power are the same."[2]

So it is that if anyone knows today that Samuel will drink coffee tomorrow, then he no longer has free will in that matter. But if God disposes all things, then none of us would seem to possess such free will.

Such a view of free will, however, might simply prove to be an unrealistic conception of what freedom entails. Thus Hume, who was impatient of what he saw as a fruitless debate about free will, wrote:

> "By liberty, then, we can only mean a *power of acting or not acting, according to the determinations of the will*... Now this hypothetical liberty is universally allowed to belong to every one who is not a prisoner and in chains."[3]

Freedom is then not an attribute of some supposed will, but is possessed by a creature as a whole when its actions are neither coerced nor constrained by external forces or agents. Seen in this way, it would be irrelevant to freedom even should someone's internal functioning be determined by predictable causes. Hume favours this "liberty of spontaneity" over the "liberty of indifference", otherwise known as libertarian free will. This is the position of the so-called compatibilists who claim that freedom is consistent with determinism.

Much theology has been compatibilist in outlook, including Augustine, Aquinas and Calvin. Secular philosophy has been also, in the line of Hobbes, Locke, Hume and Mill. I take it that Daniel Dennett, for instance, would argue that libertarian free will is more than any of us actually needs to believe: it is our ideal, but merely a projection from the sort of free will we actually experience. He considers why we might think we are free in our actions, and wonders whether it is because a small stimulus can give rise to a large effect:

> "We see the dramatic effects leaving; we don't see the causes entering; we are tempted by the hypothesis that there are no causes."[4]

And, on the other hand, we are tempted to fear unseen manipulators,

malign forces ruling our decisions. But Dennett writes, taking a compatibilist's point of view,

> "...my conclusion is optimistic: free will is not an illusion... When we look closely at the sources of our suspicion and dread, we find again and again that they are not indisputable axioms or overwhelmingly well-supported, empirical discoveries, but unfocused images, hastily glanced at."[5]

Donald MacKay has sought to defend compatibilism in a theological and scientific context. He claims to be able to show that, should our world be mechanically deterministic, this would not effect our freedom, even should we acknowledge that in principle we could predict free actions.

MacKay's demonstration proceeds as follows[6]. First he distinguishes between the "I-story" of some conscious subject A, from the "Observer-story" of those around. At time t, A's brain state is BS(t). Now consider the correct description D = "BS(t)", which some observer could in principle deduce at an earlier time and predict for A (assuming compatibilism to be correct). Now A would be wrong to believe D at time t, for in the very act of so doing his brain state would alter and D would become untrue. Neither would it be the case that D' could command A's logical assent, where D' includes A's holding of the belief that D' is correct. For whether D' is true depends upon whether A chooses to believe it or not and, MacKay argues, this remains true even should we be able to predict whether or not A will accept D'. The crux of the matter is that, even when physically determined, A cannot logically be compelled to accept any statement about what his future brain state (and hence choice) will be. MacKay calls this state of affairs logical indeterminacy, and writes:

> "What [an observer] is correct to believe about A is something that would not be true information-for-A if he (A) had it. What we have proved is thus an *ontological* rather than a merely epistemological point: it is the non-existence of a unique solution to the state-equation valid for A, and not merely its undiscoverability by A."
>
> "Thus even in a physically determinate world the outcome of A's decision has an immutable - i.e. unchangeable - specification only for those who are causally uncoupled from it until after the event."[7]

MacKay's argument seems to be that an observer and a subject will always experience events in a different way because the logical status

of certain propositions are not the same for each. That which appears determined for one will not be so for the other, because there is in operation something like the opposite of a self-fulfilling prophecy. Some very clever person could sit in isolation and correctly predict the future of the universe in every detail; but were he to leak those findings in any respect, then they could no longer be valid.

Thus MacKay's argument supports the conclusion of Dennett we quoted above. The fear that compatibilism in some way imprisons us and robs us of choice is groundless.

Issues of free will are perplexing partly because there is so much emotion involved. Humans like to imagine they are autonomous and that they progress into the future without being tied by their past. Both of these interrelated hopes appear threatened by determinism. Our autonomy is undermined, since knowing the state of the universe many years ago would seem to allow someone to predict what we will be doing tomorrow, as also the whole course of history. Adding a degree of indeterminism in the world might counteract such a prediction, but only perhaps by adding a source of randomness to our actions. Likewise, determinism undermines our sense that the future is open and undecided.

Compatibilism's truth appears to remain undecided, although Richard Swinburne suggests that it is losing popularity. It is being argued instead, he writes, that both determinism and indeterminism undermine any moral responsibility[8]. Whether or not this is so, compatibilism has certainly lost popularity theologically. Partially this may stem from a reaction against mechanical determinism in the sciences. Largely, however, it arises from the use of the free-will defence against the problem of evil, where it is God's gift of freedom to his creation which distances him from responsibility for evil.

Any strong view of God's providence inevitably leads to problems concerning human evil, problems of which Calvin was well aware. If God disposes all things, then it seems he also disposes the evil which any person may enact. How can the implication be avoided that God's omnipotence is being used for evil and so how can a human be held responsible for God's evil? Although he uses three chapters in the *Institutes of the Christian Religion* in his defence, Calvin never appears to resolve the difficulty. In fact, one must say that his

inability to make full sense of human responsibility in the light of such a strong determinism casts into some doubt the possibility of any theologically deterministic Christianity. The following is typical of Calvin's defence:

> "If all such persons [e.g. murderers] serve the will of God, why should they be punished? I deny that they serve the will of God... while the matter and guilt of wickedness belongs to the wicked man, why should it be thought that God contracts any impurity in using it at pleasure as his instrument?
>
> "[My opponents'] objection - that if nothing happens without the will of God, he must have two contrary wills, decreeing by a secret counsel what he has openly forbidden in his law - is easily disposed of... The will of God is not at variance with itself... while in himself the will is one and undivided, to us it appears manifold, because, from the feebleness of our intellect, we cannot comprehend how, though after a different manner, he wills and not wills the very same thing."[9]

Paul Helm, a contemporary theologian sympathetic to Calvin, admits that God's apparent responsibility for human evil is indeed a weak point:

> "It might appear that whatever the merits of compatibilism within the assumptions of Christian theism, it has the disadvantage of directly implicating God in human evil, since God ordains sets of circumstances which are causally sufficient for evil actions by human beings. It is true that this is a not entirely welcome result..."[10]

However, Helm argues that any theological outlook involves God in some responsibility for evil, if only in that he could have refrained from creating the universe in the first place.

The question of compatibilism remains open. However, compatibilism when combined with theological determinism does create problems in interpreting God's goodness. Those who defend it claim that here our human understanding has reached its limits of comprehension. Thus, Helm writes on a related topic:

> "In dealing with the providence of God, therefore, we are dealing with matters of ultimate significance for which there is no further explanation... the will of God, and the holy and wise reasons he has for the exercise of that will, are the highest court of appeal (highest in the logical sense). There cannot be a higher court, and so, unsatisfactory though it may be, we must rest content with that ultimate reference to the will of God."[11]

This follows Calvin, whose belief was that God in himself is utterly beyond anything his creation can comprehend. We only know God by

his accommodating (as Calvin terms it) knowledge of himself to our weak intellects. Our knowledge of God is entirely dependent upon God's own gracious disclosure of himself. Such seems to be the limit beyond which we cannot look in considering God's omnipotence. There will always be horizons in any theology which allows that no human rationality is fully equal to the task which theology itself sets us, but those horizons need to be selected carefully. What makes Calvin choose divine omnipotence as one of them?

The proposition is doubtless defensible that the majority of the Bible is deterministic in outlook, and it is this which Calvin has developed. Yet the question may be pressed why Calvin should favour the development of some doctrines above others from Scripture. A possible answer is one common to the reformation era: a desire to secure the notion of justification by grace alone. If believers are to rejoice that they have been redeemed solely by God's grace, then they need to be assured that no created agency can thwart that design. So Calvin wrote:

> "This rather is the solace of the faithful, in their adversity, that everything which they endure is by the ordination and command of God, that they are under his hand."[12]

This statement, to which we shall return, points us to the question of revelation. How can the truth of it be known? It is important to ask, in the view of a writer who at any rate accepts determinism, what his view of the source of such revelation may be. When we come to consider mechanical determinism, that will be a crucial question, for we shall find that it is the concept of revelation which becomes problematical.

(b) Calvin's view of revelation

Calvin allows that there is a *sensus divinitatis* in all people, sufficient to allow them no excuse for being ignorant of God's demands (cf. Romans 1). Yet the fall has ensured that such a faculty is now utterly corrupted, so much so that any worship of God offered by the non-Christian is worse than idolatry. Thus, there is no longer any revelation to be gained naturally. For Calvin, the only remaining source of revelation available to us is made up of two elements: first

Scripture and secondly, with equal importance, the internal testimony of the Holy Spirit.

First, then, Calvin views Scripture as central in all revelation of God. If we were not fallen, we could perceive the glory of God in his creation around us; but being fallen, we can only see that glory when we view the universe through the spectacles of Scripture, to use Calvin's favoured analogy[13].

Yet God's word in Scripture is not enough in itself; the second necessary element is the present internal testimony of the Holy Spirit:

> "For as God alone can properly bear witness to his own words, so these words will not obtain full credit in the hearts of men, until they are sealed by the inward testimony of the Spirit. The same Spirit, therefore, who spoke by the mouth of the prophets, must penetrate our hearts, in order to convince us that they faithfully delivered the message with which they were divinely entrusted."[14]

Although the Holy Spirit is the sole means of validating the Scriptures, nevertheless Calvin presents further "secondary" arguments for accepting its authenticity: its arrangement, dignity, truth, simplicity and efficacy[15]. This willingness to indicate further proofs suggests in itself that Calvin finds it difficult to identify in what this inner testimony of the Spirit consists. It is certainly not clear from his works; the uncertainty is further indicated in Calvin's treatment of Scripture's inspiration.

For Calvin, the apostles were, "sure and authentic amanuenses of the Holy Spirit"[16], and he finds that dreams and visions were the "two ordinary methods of revelation"[17] by which God's words were dictated. Yet Calvin is concerned that the prophets could have been misled:

> "Whenever God intends to make known his counsel by dreams, he engraves on them certain marks which distinguish them from passing and frivolous imaginations, in order that their credibility and authority may stand firm."[18]
>
> "Since Satan is a wonderful adept at deceiving... it was necessary that some sure and notable distinction should appear in true and heavenly oracles which would not suffer the faith and the minds of the holy fathers to waver."[19]

As in the case of the testimony of the Spirit to the reader of Scripture, however, Calvin never tries to fix the 'mark' which distinguishes

genuine visions. But it is clear that he feels that some such supernatural marker is needed for us to be assured that our revelation of God is genuine.

This completes the sketch of Calvin's thought so far as it concerns us. It has two major features: the absolute providence of God which from moment to moment determines every event which occurs; and the revelation of God through the agency of the Holy Spirit and the necessary instrument of Scripture. Let us first consider whether the replacement of a theological determinism by mechanical determinism would render Calvin's theology incoherent, and what can then be learnt of the implications of such a determinism.

(c) Mechanically deterministic theology

Under mechanical determinism, nothing happens in the world which is not fully determined by non-probabilistic natural laws. Calvin himself rejected such determinism[20], but is his theology inherently opposed to it? Our initial answer is surely affirmative. At the centre of all that we have been considering is God's downward movement of grace, without which humanity is spiritually blind. The focus of this grace is found in the Holy Spirit, present to the believer. But a believer who is nothing more than a mechanical system is not open to any external non-material interaction; there is then no point of interaction between the material and the divine. This is not to suggest that spirit is some sort of quasi-material stuff, but a means of identifying communication with God. In such a world, the Bible could have come to be written, but it would be entirely earth-bound without the validation of the Holy Spirit, as Calvin effectively argues. The problem for Calvin would be, how could one know personally with certainty God's good intentions?

It is the personal aspect of religious faith which causes problems. In such a mechanical world, it might be possible to use a form of the cosmological and teleological arguments to suggest God's existence, but a relationship with such a God would be far from that traditionally understood by Christians. Here one must be careful to say what is meant, since such a relationship can at most be analogous to a personal relationship with another human being. Perhaps there

can be a proper meaning to such terminology even in a mechanical world if the relationship is only indirectly with God, but directly with his creation. Creation would then be interpreted in terms of God's intentions towards us. But it is far from clear what the actual grounding in God of such a relationship would be. Faith for Calvin has a supra-rational content in the knowledge of God[21]; presumably mechanical creation would be subject to rational laws. Even should compatibilism ensure our minds were free and rational, nevertheless those minds would illustrate the empiricists' dilemma. The only source of knowledge for those mechanical brains would seem to be via the senses, yet we have seen in the previous chapter that such a model of knowledge appears to lead only to scepticism. Whilst such a brain could enjoy the fruit of a poetic imagination, in terms of knowledge it could only look to the analysis of sense data. In a world where all events are determined by mechanical law, these sense data could carry no communication from a personal God.

One strategy to deal with this problem of God's communication might be to increase the force of one's determinism by supposing that the only truth which there is, has been programmed into the mechanical system. Just as a computer may complete correctly a rational calculation although the machine itself has no inherent rational freedom, so all that happens in the world may have been set up so that humanity arrives at a correct belief in God even whilst it lacks the means to find God independently. Thus one says, "I know God's good intentions towards me because I happen to believe in them. That I believe this shows itself that God has set up the network of mechanistic causation of which I am part in order that I should believe. Thus, so far as anything can be known to be true in a deterministic system, it is true that God has good intentions towards me." This belief is coherent, although it undermines any notion of human responsibility, as also the notion of absolute truth. Furthermore, it might in fact not be too far from Calvin's ideas, notwithstanding his dislike of perpetual chains of causes. It preserves our utter creaturehood under God's dominion who carefully set in motion the series of causes; it also allows Calvin's belief in pre-election: only those who have been given the right ears may hear. Nevertheless, this view does not hold much appeal, preserving God only by proxy in

his creation.

Perhaps it is possible to save the situation by the introduction of miracles as the means of God's self-revelation. We could here envisage arbitrarily many miracles occurring, although this seems implausible on two counts. First, the description of the universe as mechanically deterministic would then hardly be accurate, since much that happened would not be in accordance with physical law. Secondly, the adequacy of God's creation would be called into question. It would seem that the creation which God saw to be good could only fulfil his purposes by its natural order being constantly overridden. Indeed, this objection can be raised generally against the occurrence of miracles.

If one wishes to preserve Calvin's view of God as active at every point in history, one might think that a very high number of miracles would be needed. Yet we suggested above that Calvin's motivation in wishing to preserve God's absolute providence was the assurance of our redemption. He wanted to demonstrate the certainty of God's salvation in the life of the believer by indicating that nothing in heaven or earth could overcome God's benevolent protection and his justice.

However, if it is indeed the case that Calvin wanted to secure justification by grace alone, then it is not fundamentally necessary that the lives of believers on earth should be guaranteed by God in every mundane detail. It is sufficient for the individual to be assured of ultimate salvation; for Calvin, that assurance consists of the internal testimony of the Holy Spirit vindicating the witness of Scripture, as we have seen above. Thus it seems that if each individual experiences once the internal testimony of the Holy Spirit, then it is possible for the rest of Calvin's theology to remain largely intact. Having once been assured about the reliability of Scripture, the believer can confidently use Scripture as spectacles for viewing creation. A version of Calvin's system survives mechanical determinism, assuming that God intervenes a minimum of once in the life of every believer.

Of course, this is not to pretend that major changes from Calvin's outlook would not then be needed. Quite apart from miracles and the sacraments, Calvin sees God's justice constantly at work. Yet

on the other hand, certain aspects of mechanical determinism fit in well with Calvin's views, especially those on pre-election. The importance of pre-election in Calvin's theology should not be overstated, but is the other side of the coin in emphasising God's omnipotence. Calvin also ties into this issue the reformation view of humanity's lack of free will:

> "If such a barren invention [as free will] is accepted, where will that omnipotence of God be whereby he regulates all things according to his secret plan, which depends solely upon itself?"[22]

Free will here is not so much the will to make the common choices of one's life, as the will to choose or reject higher spiritual realities; it appears to be consistent with a world of mechanical determinism.

If this view is accepted, that is mechanical determinism with an occasional intervention by God, then we have a picture of people living lives without metaphysical free will, some of whom by divine favour know themselves to be redeemed, relying upon Scripture for a true view of the world. There are wider difficulties with this view, but one guesses that such difficulties would not severely worry Calvin. Two of them are as follows.

First, as Aubrey Moore noted, there are difficulties with any doctrine which involves only God's occasional intervention: "A theory of occasional intervention implies as its correlative a theory of ordinary absence." Thus a common consideration nowadays is that if God could intervene in any one instance, then why did he not intervene to prevent Auschwitz? Once we allow God to intervene in the affairs of the world, but on only a limited number of occasions, then deep questions arise about God's own morality, or at least the mysterious ways in which he moves. Calvin would no doubt consign such questions to the unknowable mystery of God's inner councils.

A second difficulty is how the inner testimony of the Spirit is to be recognised by a believer. This is a problem already present in Calvin's original scheme, as we noted: what mark could be given us to indicate Scripture's reliability? But it is made more pressing when God's direct activity is not commonplace. As Hume argued in the case of miracles, the less common an occurrence, the more evidence we need to believe it. If God rarely acts, then his action could be misconstrued merely as an unfamiliar natural phenomenon. This prob-

lem is not in essence reduced even if such testimony repeatedly occurs, say whenever one is actually reading Scripture. Our experiences are interpreted in a wider framework of beliefs, but there would be no wider framework under which to comprehend some effect synchronized with scripture reading. For instance, some such effect could conceivably be a warning that Scripture is false and not true; there would seem to be no way to know.

We conclude, therefore, that a theology which proposes that creation is mechanically deterministic, with a God who considers himself free to intervene, is fundamentally coherent with Calvin's views. However, such a theology is not without problems. There is first the apparently arbitrary nature of God's actual interventions; more importantly for us, there is the difficulty of recognising in principle God's interactions against a background of regularity.

(d) Theological determinism with physical indeterminism

We have been examining theological determinism in the light of mechanical determinism. Even if we are prepared to accept theological determinism, with its weakness in God's apparent responsibility for evil, we have found difficulties in its combination with a mechanical determinism. These problems are associated in particular with revelation. Let us now consider the case when physical indeterminism is introduced.

First, the form of compatibilism to which one is committed can be modified. No longer need it be straightforwardly a compatibilism with mechanical determinism, but rather with theological determinism. This may free us from the sense of being absolutely bound by our history; God would be able to act graciously to create something new in our lives.

Secondly, it appears that the problems encountered concerning revelation are eased, especially if one is not willing to countenance the presence of miracles. If there are elements of indeterminacy in the world, then God could possibly use correlations of events (within the limits set by probabilistic physical laws) in order to commune with his creation. However, a point made innocently by Donald MacKay gives cause for concern:

> "'Natural laws' are neither necessary nor even available to [God] as an instrument of creation; for he creates by a mere word, and what we call natural laws emerge only *post hoc* as features of and within the created order."[23]

Accepting this seems to imply that natural laws are something of an illusion. They do not actually govern what is happening in our world; they are only the regular patterns which God has allowed to emerge in his creation. This might be merely curious if the laws involved are fully deterministic. But where the laws are indeterministic, there is an awkward suggestion that we are deceived by those laws we properly deduce empirically. There is in reality no such thing as a random physical event, since God has determined each one. Why then does he arrange the creation so that we are led to believe that indeterministic laws actually function? In the absence of some good reason, our belief in a God of truth seems compromised: God would seem to mislead us into believing that there is physical significance in the probabilistic patterns we observe, when there is none.

It is noticeable that the problems of mechanical determinism are not assuaged merely by the introduction of indeterminism. To be intelligible, theological determinism appears to need miracle or a peculiar form of physical indeterminism in order to allow for revelation, and either option has difficulties. Before concluding our discussion of determinism, however, one more factor needs to be introduced: that of God's timeless eternity. Here, we will suggest both that modern science might favour such timelessness and also that this itself would then imply a theological determinism.

(e) God, timeless eternity and determinism

William Alston has stated the principle that, "wherever possible, we should subordinate ontological categories to God rather than subsuming God under the categories."[24] One question is therefore whether time should be included under this principle, whether God himself is bound to experience successiveness as does his creation. This is a multi-faceted question with many diverse implications. Furthermore, there is no clear court of appeal to decide the issue. Traditionally, God is deemed to be eternal, but the meaning of that term has been interpreted differently. The Bible itself, for instance,

arguably understands eternal to mean everlasting, whilst classical theology usually understands eternal in the sense of timeless.

In our deliberations, we are attempting to take the findings of modern science seriously. One of the more startling developments of this century has been the theory of relativity; and it seems to me that this theory suggests that the flow of time we experience is in fact not fundamental to the ordering of any created universe, but contingent, for the following reason.

Special relativity may be derived mathematically from one observation (or, strictly, hypothesis). If two people, A and B, are standing together when A fires a bullet which B chases, then the bullet recedes from B more slowly than from A. However, if, instead of a bullet, A "fires" a pulse of light, then no matter how fast B runs, the light recedes from B at exactly the same speed as from A, so far as they are individually concerned. From this hypothesis flows all the results of special relativity, including time flowing at a different rate for A and B by virtue of their relative motion. Now it is conceptually possible that this hypothesis about the constancy of the speed of light should be false; indeed, Newton assumed so. Hence, one appears justified in saying that, even if God is in his essence temporal, nevertheless the specific form of his creation's temporality (so far as we presently understand it) is contingent.

Furthermore, relativity implies that someone may observe two events to be simultaneous, whilst another observer moving relative to the first (in a different so-called frame of reference) sees those same events occurring at different times. It therefore becomes a real question to ask which frame of reference a temporal God would occupy, and so which events across the universe he observes to be simultaneous. Again, there would appear to be contingency in God's choice.

These considerations are not conclusive, of course, in arguing for God's timelessness. There may be some undiscovered reason for the laws of relativity to be logically necessary in our universe; even if not, to say that the passage of time has a contingent aspect is not to show that God is not subject to some other type of temporality. However, they do at least point towards time as being not a fundamental ontological category under which God should be subsumed, thereby implying that God himself is timeless. Such a view finds sup-

port from classical theology.

Let us suppose that God is timelessly eternal. Does this have any implications for our topic of determinism? We shall argue that it does: namely, that the former entails the latter.

Boethius, following a suggestion of Augustine, famously defined eternity as, "the total and complete possession of unending life, all at once."[25] Although God's timelessness is strongly motivated by considerations of the contingent nature of created time and also allows for a strong conception of God's omniscience, it is not without problems, of course. Some of the problems cluster around whether the notion of timelessness is coherent. Anthony Kenny argues it is not:

> "The whole concept of a timeless eternity, the whole of which is simultaneous with every part of time, seems to be radically incoherent. For simultaneity as ordinarily understood is a transitive relation... on St Thomas' view, my typing of this paper is simultaneous with the whole of eternity. Again, on this view, the great fire of Rome is simultaneous with the whole of eternity. Therefore, while I type these very words, Nero fiddles heartlessly on."[26]

This criticism is not successful, however. "Simultaneous" is itself a temporal concept, and so is inapplicable to any notion of timeless eternity. Such eternity simply is; it is not at any time or simultaneous with any temporal event. An analogy might be with an arithmetical proposition such as 2+2=4. It is nonsense to say that such a proposition is simultaneous with anything, yet it is eternally true.

However, the difference with such a proposition, it might be pointed out, is that God is said to be living. Timeless life is indeed a foreign concept to us; but the problems of understanding how God can have life if timeless seem no greater than understanding how God can have life if outside space. Some might argue that God's spacelessness in fact causes equal problems, but nevertheless we generally seem to accept that concept without immediately protesting its incoherence. Thus, in the same way as we understand that God can act in space without himself being in space, similarly he can act in time without being within time. Having knowledge timelessly is also within our conception through our experience of memory: we know timelessly, for instance, mathematical truths.

Understanding how God responds to his creatures is more difficult, however. This is especially so if his creatures are under-

stood to have libertarian free will. The essence of such free will, as we have seen, is for any choice to be unpredictable. Thus we are to imagine two identical people in identical circumstances nevertheless being able to make different choices. But that means even God must logically wait on their response in order to determine his own response, which contradicts the notion that God is timelessly eternal. From timeless eternity, God could not create a world in which he responds to the circumstances of creatures with libertarian free will.

Even should God be able to know timelessly all our free responses, this yet creates a problem. Assuming that God interacts with his creation, then from our point of view, God knows today what our free choices will be tomorrow. But that very fact means that libertarian free will has been eroded, for it is no longer the case that no one can know what our choice will be. The conclusion appears inevitable that a timeless God and libertarian free will are incompatible. This is the conclusion also reached by Paul Helm in his defence of God's timelessness:

> "So it emerges that one important reason for maintaining that God is in time is that this alone provides scope for human indeterministic freedom."[27]

(f) Conclusion

In this chapter we have glanced at the particular example of Calvin's theology as one with a high degree of theological determinism. Such determinism could be made compatible with any science, since God can presumably arrange for the appearance of physical laws to be preserved. This is not, of course, necessarily welcome from the point of view of science, whose incentive is to lay bear the causal workings of the world. Indeed, this element of God preserving aspects of the universe for appearance's sake is possibly one of the unattractive features of such determinism.

Other problems with such theological determinism involve those of human responsibility and divine responsibility for evil. These are weaknesses, although they do not rule such determinism out of court. However, we have found that mechanical determinism in particular does not appear to cohere well with theological determinism, particularly through problems of understanding God's revelation. On

the other hand, only a deterministic theology enables an omniscient God to be timelessly eternal. This could be an advantage, since modern physics presents some reason for believing the structure of time in our universe to be contingent and therefore not part of God's necessary being.

Let us bear these problems with theological determinism in mind whilst turning next to investigate whether modern science itself may provide a key to understanding God's interaction with the world. This we shall do in the next two chapters, first via a consideration of anti-reductionism in science and then through an exploration of the newly-found openness of physical systems.

Chapter 5: The Anti-reductionist Approach to Divine Interaction

In chapter two, we had cause in passing to remark upon Maurice Wiles' brief riposte to an argument concerning God's interaction with his creation. That argument, advanced by Michael Goulder[1] and Stuart Hall[2], concludes that we should not regard with any more favour the proposition that God only communicates with us directly through our minds than that he modifies any other event in our world. This makes the the assumption that our minds are constituted by the atoms of the brain, so that changing the weather or changing our minds each involves God's moving of atoms around. As we then quoted, Wiles responds by writing:

> "[This] conclusion does not follow from the fact that psychological changes may always involve concomitant changes in the brain circuits; [the] argument would only be valid if we were to hold a false form of physical determinism according to which psychological changes could only be brought about by a prior modification of the brain circuits."[3]

Wiles does not expand upon this response, but, given his concern to take full account of the world as regularly ordered, it appears to be based upon an anti-reductionist approach to science. Anti-reductionism is one development in the evaluation of science which, whilst being fully consonant with present science, might also allow some ways forward in considering divine interaction with the world. Where reductionism claims that every phenomenon is no more than the sum of its most basic components, anti-reductionism contends that genuinely novel phenomena may emerge as physical systems become more complex. A vast literature on the subject has been spawned in recent years, aimed not so much at discrediting reductionism, however, as at trying to construct an adequate alternative[4]. We shall review some of the problems encountered later, with reference to our theological interests; first, however, we summarise reductionism, motivated largely from a rejection of dualism, before considering its inadequacy. These issues are further investigated in a discussion of the mind-

body problem which has important implications for any concept of divine interaction.

(a) The varieties of reductionism

Reductionism is perhaps best described as more of a working hypothesis than a theory, both because it is adopted by working scientists in rather an *ad hoc* fashion and also because there are those who deny that there are in any case any successful examples of a scientific reduction[5]. Care must be taken to distinguish between the different connotations with which the term "reduction" is used, and indeed between "reduction" and the strong claims of "reductionism".

Insofar as reduction refers to a methodological technique, then it is hardly a matter of controversy. This technique is to approach an analysis of any given system by breaking it down into its constituent parts and studying the interactions of these simpler entities. No one denies that this has been a highly successful method for advancing knowledge. As long as the stronger assertion is not made that it is the sole method of valid investigation, by which, say, the humanities are also to be judged, then it is benign.

Epistemological reduction builds upon methodological reduction by founding the conceptual understanding of any system upon deductions from the interactions of its constituents rather than from the system as a whole, thereby mirroring the practical analytical techniques of science. Thus, for instance, the valid explication of optics, the science of the reflection and refraction of light waves, is taken to be derived exclusively from the theory of electromagnetic radiation and in terms appropriate to that theory. This type of reduction was the springboard of seventeenth-century science, overthrowing final causation as the primary category of science in favour of efficient causation. In the weaker and less controversial form of epistemological reduction, one may observe that as a matter of fact some such reductions exist and are at least modestly successful. A stronger form, however, asserts that such reductions will always exist and be successful for whatever system is under consideration; indeed, if an explanation does not consist of such a reduction, then, such reductionism assumes, it is not a complete explanation. It is this assertion

which is controversial in contemporary debate, but before it is reviewed further, we will set it in the context of a third type of reduction, known as ontological.

Whereas epistemological reduction makes claims about the ways in which we can know and understand any system, ontological reductionism is a metaphysical statement about what exists. In its simplest terms, its proposition is that nothing beyond the most elementary building blocks of any system has any real existence. Fully clarifying the concept of ontological reductionism is not as easy as it might first seem, however, since it is no easy matter to define what is meant by something having real existence. Indeed, a philosopher such as Evandro Agazzi can take it to be to be more or less self evident that ontological reductionism is false:

> "[Substance] is not something indeterminate and mysterious to which the properties are 'added' or cling. A substance *is* the ensemble of its properties and it is differentiated from other substances precisely *because* it possesses ontologically different properties...
> "The world ... is full of very different substances ... each one characterized by its properties, in part intrinsic, in part dependent upon the relations which they maintain with other substances, and the various disciplines attempt to study them according to limited points of view, each one occupied only with certain properties."[6]

For instance, Agazzi argues, one of the properties of gold is its value in the world's metal markets, but this property must be inaccessible to scientific investigation which properly is concerned only with a particular range of gold's properties. Thus what it is to be gold in all its fulness is not subject to ontological reduction.

Whilst Agazzi's argument may appear cogent, one can discern from it that the question of ontological reduction depends upon a full discussion of the general issues of ontology. Happily, for our purposes, we do not need to encompass this complex region of philosophy, since ontological reductionism is sufficiently comprehended as a reaction against Cartesian and other forms of dualism; in other words, it is a guise of physical monism and it is in this context that the contemporary debate concerning epistemological reduction also should be placed.

Cartesian dualism was the metaphysics constructed from the desire to avoid scepticism whilst maintaining the newly-gained outlook

of a mathematical science. To do this, it proposed a dualism between matter and spirit within the human person who is to be the rational observer of the objective world, and so gave rise to the so-called mind-body problem. It is the difficulties associated with this problem which have led to the widespread abandonment of Cartesian dualism, and thus to the rise of ontological reductionism. Let us now review these problems.

(b) Cartesian dualism

Keith Campbell[7] summarises the conundrum in the form of the following inconsistent tetrad, such that any three of the statements are consistent but entail that the fourth is false:

(1) the human body is a material thing;
(2) the human mind is a spiritual thing;
(3) mind and body interact;
(4) spirit and matter do not interact.

To find a neutral definition of either spirit or matter is neither easy nor has it been accomplished, but we may say, in an informal way, that spirit belongs to a class of things of which matter is the other member: spirit and matter are two items with an equal ontological existence. Accepting propositions (1) and (2) means that, for consistency, either (3) or (4) must be rejected; either course of action, however, brings difficulties.

Denying (4) leads to an interactionist dualism in which spirit interacts with matter. But this would surely reveal itself through the matter of the brain (or wherever the interaction is to be located) behaving anomalously with regard to physical law, a discrepancy which should be scientifically observable. Thus far, there has been found no evidence from physiology of such an anomaly and the common assumption is undoubtedly that no such anomalies exist. A possible exception to this expectation in scientific circles is the brain scientist John Eccles who remains a dualist. He maintains as a "primal certainty... the certainty that one exists as a unique self-conscious being," and continues:

> "Since materialist solutions fail to account for our experienced uniqueness, I am constrained to attribute the uniqueness of the Self or Soul to a supernatural spiritual

> creation. To give the explanation in theological terms: each Soul is a new Divine creation which is implanted into the growing foetus at some time between conception and birth."[8]

However, it is not clear what is this primal certainty of uniqueness which demands a supernatural creation, and neither does Eccles offer any insight into why the soul's activities should never be observable scientifically within our brains. He makes the suggestion that the mind is analogous to the probability fields of quantum mechanics, which have neither mass nor energy[9]. But interestingly this proposal has been made elsewhere, not as an analogy but as a possible actual mechanism for mind[10]. Having given a scientific analogy for mind bordering on the explanatory, there seems little reason not to go a step further in accepting the possibility of a fully scientific description. Ultimately, it is difficult to see how one can allow a spiritual interaction without bringing spirit and matter into the same category and within the ambit of science.

The alternative in this presentation of the mind-body problem is to deny (3), leading one to parallelism in which the mind runs alongside the body but does not effect it in any way. Either one may follow Descartes in claiming that bodily and mental events were always in step but totally unconnected, or one may follow the epiphenomenalists in allowing the body causally to determine the mind's state but not vice versa. Whichever one chooses is not very attractive, since both do violence to our conviction that what goes on in our minds plays a crucial role in how we act; indeed, without some notion of rationality it is not clear that we act at all, but merely respond. Neither do the descriptions appeal through simplicity, since they leave us with two separate systems, one material and the other spiritual.

However, the major objection to any such dualism must surely be the conceptual difficulty and elusiveness of spirit in this scheme. If spirits are non-material, then they are non-spatial, in which case the location as well as the individuation of spirits become a problem. One solution which enables each human body to have one spirit only, as Locke pointed out[11], is to give spirit location but not dimension, so that it is located at one point alone in the human body. Where that point would be and how it could interact with the whole of the brain is still a difficulty. It is known, for instance, that a

sensation of pain is associated with an extended and complex pattern of neurons firing.

A further difficulty with this account is that it seems at least possible that evolutionary science will successfully trace a continuous development of life from complex molecules in a primeval soup through to present day humanity. Presumably there is a point on that journey where spirit is first required to explain the life form then reached, but such a point seems arbitrary. A similar point must likewise be reached in the development of any one human foetus sometime after conception, a point which also appears to be arbitrary.

None of the above proves that a spirit-matter dualism cannot possibly be true, and indeed it continues to be defended by some distinguished writers[12]. Yet considerable doubt is cast upon its being the simplest explanation possible, so that Occam's razor may be called into play. Cartesian dualism does not appear to be any longer tenable.

(c) Emergence and anti-reductionism

Having rejected dualism, we may now return to our discussion of reductionism with greater insight. For if one does not have any confidence in the existence of spirit in the Cartesian sense, then one is naturally inclined towards an ontological reductionism. As we have hinted in the example of Agazzi's argument above, such reductionism is prone to open-ended debate since it is a broad metaphysical assertion. However, ontological reductionism reinforces the expectation of the success of epistemological reduction, and it is this latter which may more easily be tested. If everything in our world is constituted of one type of stuff, then we may think that theories which describe the fundamental interactions of that elementary matter would allow us to understand completely all the complex systems to be made from it. This is the expectation which gave rise to the sobriquet "nothing buttery" for reductionism: sociology is nothing but psychology; psychology is nothing but biology; biology is nothing but chemistry; chemistry is nothing but physics. The question is whether this expectation has any prospect of being met.

Carl Hempel formalized the notion of an epistemological reduc-

tion as follows, taking the example of the reduction of biology to physics[13]. Consider two biological events, B_1 and B_2 for which B_2 may be predicted given B_1 and some biological law. Biology will then have been successfully reduced to physics if the terms of B_1 and B_2 may be restated in physical terms P_1 and P_2 and some physical law found from which P_2 may be predicted given P_1.

Here we have a logical statement of what a reduction entails against which we can test examples claimed to be successful. If, as the anti-reductionist asserts, the attempt sometimes fails to describe the more complex system purely in terms of laws appropriate to its constituents, then it is said that the system exhibits an emergent property. For instance, it may be suggested that the quality of water which we experience as wetness is emergent because no analysis of the physics of water molecules would adequately subsume that property. Whether such emergent properties are ontologically real is the matter of dispute towards which Agazzi's argument is directed, but it is this further consideration, albeit important, which we can here afford to ignore[14]. The relevant point is that the emergent property is one which cannot be reduced. Since, however, emergence is something found only when an analysis at a particular level has failed to reduce a higher level, it is by its nature elusive. Proofs of failure of this nature are difficult to construct. Karl Popper and Mario Bunge provide us with two examples of defining emergent properties more closely, but both are open to question.

Popper takes a very broad view of the existence of emergent properties. He claims that even the reduction of chemistry to physics fails because the quantity of helium in our universe is inexplicable without the irreducible use of cosmology and its hypothesis of the big bang at the start of the universe[15]. Popper speaks of hydrogen fusing to form helium as an emergent property because it is unforeseeable outside the special circumstances of the big bang. This would appear to be an overstatement, however, since surely the properties of hydrogen's fusion are always present even should they not be activated.

On the other hand, Bunge defines an emergent property more closely as one which characterizes a system as a whole and is not possessed by the components of that system[16]. But, as Manfred

Stöckler points out[17], this would commit us to saying that a clock or even a chair has emergent properties. Do we really want to say that these artefacts cannot be reduced?

By its nature, it seems, the analysis of emergent properties may only be achieved on a case-by-case basis. The point of greatest interest, both scientifically and theologically, is the reduction of biology to chemistry. It is here that it is most plausible that reduction fails, and we may illustrate the suggestion through the work of Richard Dawkins.

Dawkins has written a popular and influential book entitled *The Selfish Gene*[18]. Although he does not discuss reductionism explicitly in it, Dawkins' approach is reductionist in that he looks for the explanation of the world's diverse life forms to its molecular basis. He states:

> "The argument of this book is that we, and all other animals, are machines created by our genes. Like successful Chicago gangsters, our genes have survived, in some cases for millions of years, in a highly competitive world. This entitles us to expect certain qualities in our genes. I shall argue that a predominant quality to be expected in a successful gene is ruthless selfishness."[19]

Dawkins is a self-proclaimed Darwinist, judging competition within any population to be the key to understanding its development. Yet we here see how awkwardly such a belief sits with biochemistry. Presumably Dawkins believes that genes are no more than complex organic molecules, but then the description 'selfish' appears to be out of place: what meaning can be given to 'selfish' in such a context? Or, indeed, what meaning can be given to the statement that we are machines created by genes?

Dawkins himself is impatient of such observations, commenting at one point:

> "This strategic way of talking about an animal or plant, or a gene, as if it were consciously working out how best to increase its success... is a language of convenience which is harmless unless it happens to fall into the hands of those ill-equipped to understand it... It seems some people, educationally over-endowed with the tools of philosophy, cannot resist poking in their scholarly apparatus where it isn't helpful."[20]

Yet it is not clear that talk of selfishness and so on is merely a matter of convenience, since it is not apparent how one could other-

wise express the same ideas, whether or not they are correct. Indeed, it seems that Dawkins himself is sometimes confused by attempting to use terms such as "selfish" at the level of a molecule rather than of a complete animal. For instance, compare the following statements:

> "Genes 'determine' behaviour only in a statistical sense... There is no reason why the influence of genes cannot easily be reversed by other influences."[21]

and:

> "By dictating the way survival machines and their nervous systems are built, genes exert ultimate power over behaviour... Genes are the primary policy-makers, brains are the executives."[22]

Thus one suspects that the insights of Darwinism might not be simply reduced from the level of herds of beasts competing for food to the level of genes within a given animal. There are concepts which are simply not applicable to the lower levels of description; "competitiveness" and "selfishness" would here be emergent properties, since Dawkins' reliance upon them suggests that they cannot be fully restated in terms appropriate to biochemistry.

We are now in a position to understand the importance of anti-reductionist claims. As David Charles and Kathleen Lennon point out,

> "what is distinctive about these modern anti-reductionist strategies is that they are avowedly anti-dualist. While defending the autonomy of the particular discourses with which they are concerned, they none the less accept some form of *supervenience* [i.e. emergence] or dependence claim, grounding such discourses in underlying materialist or naturalist ones."[23]

Modern anti-reductionism is thus not claiming that biology cannot be reduced to chemistry because, say, there is some quasi-vitalist constituent of life, but rather it is claiming that the discourse appropriate to biology is not simply some conglomerate of discourses appropriate to chemistry. This may sound warning bells as we now turn to the contemporary discussion of the mind-brain problem. For whilst, as Wiles has indicated, we may find that mind is an emergent property not describable in the physical terms appropriate to atoms and molecules, yet the grounding for this is nevertheless materialist. If God acts in our minds, he would still do so within the matrix of an entirely physical system and so the arguments of Goulder and Hall

may not be so readily dismissed as Wiles seems to suggest. We now turn to these issues more specifically in discussing the modern philosophy of mind.

(d) Mind-brain theories

One possible theological hope of an anti-reductionist approach to the description of mind might be the preservation of the traditional Christian theology of a God both transcendent and immanent, without at the same time contradicting the modern scientific viewpoint on the nature of creation. If it turns out that the mind must be described irreducibly relative to its physical substratum of the brain, then perhaps here is an opening for God's interaction with the world without the violation of any physical law. God might then influence our minds without disrupting the causal nexus of our brains.

This would maintain what may be called physical monism. Of course, to allow our requirement of a transcendent God means that one cannot be a true monist: there must be a dualism between God and the world. Nevertheless, we shall use the term as differentiated from Cartesian dualism. A physical monist admits only one substance in the created order, that of matter. Part of the reason for holding to physical monism in our case will be its widespread acceptance in the modern Western world, the background against which we are attempting to conceptualise our theology. Yet, as we summarized above, there is also good reason for rejecting as its alternative a dualism of spirit and matter.

In essence we are thus considering the question whether a traditional theism can be compatible with a physical monism of the created order, demanding as it does an explanation of where and how the divine and created realms might interact. We concentrate on the mind-body problem for two reasons. First, it is in any case a problem where, in certain theories of the mind, physical monism is severely tested as a coherent possibility in a context separate from theology. Secondly, intuitively it would also seem that the mind is crucial to an understanding of the revelation of God.

We have mentioned that, in one sense, any theist must be a dualist. Thus, our question seems unavoidably couched in terms of

interaction: how do two substances interact? This is also the question at the centre of the mind-body problem, where the substances involved are the mental and the physical. As with matter and spirit, however, there are immediately problems of definition because it is not clear how the mental and the physical may be defined so as not to entail the conclusion towards which one wishes to argue. This becomes apparent as we review some of their possible definitions[24].

Mental items are often categorised as being characteristically either sensations or propositional attitudes. A propositional attitude may be recognised by propositions which include the word 'that' and a 'mental verb', such as 'believe' or 'desire'. Already, there is a difficulty here, in that sensations and propositional attitudes seem to be fundamentally different, so as not to be easily circumscribed by one conception of the mental. Two definitions of the mental incline towards one or other of these aspects: the criterion of intentionality, and the criterion of the 'direct' or privileged access to experience.

The epistemic definition of the mental identifies, as mental, events of which a subject is directly aware. This suffers from two problems in particular. First, contexts in which such epistemic terms occur do not sustain substitution of co-referential or logically equivalent terms: they are non-extensional. For instance, it may be true that I am directly aware that this pen (which in fact caused Jones' death) is red, yet false that I am directly aware that the pen which caused Jones' death is red. This indicates that the class of mental events, so identified, is not well defined. A second problem is that direct awareness applies readily to sensations, but less obviously to propositional attitudes. For instance, I may think that I have direct awareness that I prefer oranges to apples, whilst this preference could be shown to be false if it were observed that I eat more apples than oranges.

The criterion of intentionality also has its difficulties. This criterion in its linguistic form identifies, as mental, propositional attitudes which vary markedly in their semantic behaviour from physical propositions. Thus, propositions including a mental verb sustain neither the substitution of co-referring expressions in its sub-clause nor the existential generalization of that sub-clause. Donald Davidson, whose theory of anomalous monism is described below, then defines an

event as being mental if it is describable by an expression which contains some 'mental' verb non-eliminably. However, now the problem arises that in fact such a definition is too wide. Surprisingly perhaps, it can be shown that as long as there is a mental event spatiotemporally related to every event, then any event counts as mental. For instance, the description of the sinking of the Titanic, "The Titanic sank at the same place that, ten years later, John realized that the world is round," must count as mental.

It may seem that such problems are at the level of logical nit-picking. Yet they have serious consequences if one tries consistently to propound an identity theory of mind and matter. If all physical descriptions can be formulated in terms of mental descriptions, then the truth of some form of identity theory is thereby entailed. One needs also a strong conception of the physical, yet there are equally great difficulties in defining what one might mean by physical.

One possibility is to say that for a predicate P to be physical, then 'x has P' entails 'x has extension' or 'x has spatial location'. But this does not prove to be so straightforward a definition, since extension or spatial location is only entailed by the use of what may be called 'meaning postulates'. Thus, 'x is 50 kg' does not directly entail that x has extension: we make the assumption from our science that anything with mass has extension, which is then a meaning postulate. But these assumptions are admitted in interpreting such statements, we need to draw further boundaries. For one may now argue that 'x is a perceptual experience' must involve the perceiver's eyes and therefore also entails spatial location. Likewise, if one denies the existence of a mental substance, 'x is a thought' must have spatial location if it involves a person's brain.

Another possible definition of the physical is that an event is physical if it instantiates a physical law. But there is here a great danger of circularity introduced through the notion of a physical law: for instance, presumably a physical law is partially recognized by its physical terminology. But this assumes one already knows what is physical terminology. Also, it defines the physical as that which exhibits law-like behaviour, whereas this certainly is not a primitive observation of the material world about us.

The analysis of the world into physical and mental items is therefore not at all self-evident and so a positive statement of physicalism, functionalism and anomalous monism, three schools of thought on the origins of mind, is not straightforward. Their negative statement is slightly simpler: against Cartesian dualism, they each deny that there is ontological content to the concept of a spiritual mental substance; against behaviourism, they deny that mind is an otiose concept.

We have ourselves argued against Cartesian dualism above; before noting the characteristic features of these three theories, we turn briefly to the position of behaviourism. The behaviourist represents the opposite extreme from the spirit-matter dualist by denying the existence of mind at all. Rather, it is claimed, the mental state is identical with the outward behaviour, so that, "references to the causes of behaviour are transformed into descriptions of patterns in the behavioural effects themselves."[25] While such an explanation is simple and dismisses the mind-body problem, it is undoubtedly oversimple. Consider the person who only pretends to be in pain: the behaviourist seems committed to saying that either, against common sense, such a person is in fact in pain, or that a perfect pretence is not possible so that we can tell that real pain is not being suffered. But even if perfect pretence is not possible, nevertheless there appears to be something amiss with a theory which can only distinguish between true pain and pretended pain through the minutiae of the behaviour, distinguishing between pretence-pain behaviour and non-pretence-pain behaviour, but not allowing the existence or otherwise of an actual pain.

If we thus reject behaviourism as well as Cartesian dualism, let us therefore sketch the alternative theories we have mentioned.

Physicalism (or materialism or type-type identity theory) affirms that any statement about the mind can be formulated without remainder as a statement about the physical state of the brain. We might find, for instance, that 'pain ≡ brain state α', in which case observing a brain in such a state we know immediately the contents of the associated mind. But this theory, associated particularly with J.J.C. Smart[26] and D.M. Armstrong[27], is now widely thought to present two insuperable problems.

First, it is difficult to imagine how the qualia of mental phenomena can be translated without remainder into the language of physics. Thus, how can 'dull' as applicable to pains be also applicable to brain states? In reply to this objection, Smart explained that the report of a dull pain happens to be the report of a particular brain process[28]. There is no such object as a pain which can have qualities such as dullness; there is only the experience of a dull pain which is contingently identical with a particular brain state. This contingency is needed because the relationship of a dull pain to, say, a sharp pain has a different logical description to the relationship between the corresponding brain states. Yet Saul Kripke objects that the notion of contingent identity needs to be handled carefully. He introduced the concept of a rigid designator, that which names an object not only in this world but in every possible world in which that object exists. Identities involving rigid designators are then necessarily, not contingently, true. Now, the so-called Cartesian intuition supposes that pain, say, might have existed apart from any physical type of the phenomenon; pain is therefore a rigid designator. Thus, statements identifying pain and a physical brain state are, in fact, necessarily true if true at all. Hence the original objection stands that the qualia of mental phenomena cannot be identical to a physical state, so long as one accepts the Cartesian intuition that the very nature of pain is in its phenomenal properties.

The second objection is that of variable realizability. To continue with the example of pain, it seems intuitively correct that many different animals, as well as many different humans of different dispositions, all feel pain as the same thing. Hence, pain cannot be identified merely with any one physical state. It is open to the type-type identity theorist to propose that pain is not identical to one brain state, but to a disjunction of many different brain states. However, the theory itself would then appear to be seriously stretched, if not completely undermined, if it has to be imagined that pain is only identical with a possibly infinite disjunction of heterogeneous physical states - the identity of pain with no particular state. Further, it would seem unlikely that empirical science could ever find such a series of states in practice.

This brings us to the second category of identity theories,

that of the causal-role or functionalism, which seeks to overcome the problems of variable realizability in particular. In fact, there are many versions of these theories, so our present treatment is very much a simplification. The theory is parallel in some ways to behaviourism, in that it is primarily concerned to understand the connection between any stimulus and the response of a system such as the brain. However, unlike behaviourism, it allows that there is indeed something we may call 'mind' which plays an active part between the input and output of the system. The approach is modelled closely on the idea of a computer system and especially the so-called Turing machine which Alan Turing believed could in theory model a human person to a high degree of accuracy.

In an article called "Mad Pain and Martian Pain"[29], David Lewis describes a thought experiment supposing that Martians exist and behave like human beings. Yet they might not have brains at all; it might be that Martians have hydraulic feet and that pain for them goes with an increase in hydraulic pressure rather than anything going on in their heads. Thus, rather than saying with the physicalists that 'pain ≡ brain state α', we should say that 'pain for S = brain state α', whereas 'pain for T = brain state β' and so on.

However, to this proposal, it may be objected that there remains no such state as the one occupant of the causal-role definitive of pain. Thus it is not clear that the description of pain is properly fixed; there is no uniqueness of reference. But there are further problems even should one be able properly to define causal-roles. John Searle[30] considers someone who only speaks English locked in a room with a two-way video communication system to the outside world. In the room are batches of what is in fact Chinese script. There are also instructions in English which tell that person to hold up certain of the squiggles in response to people outside the room holding up certain squiggles, identified through comparison with one of the batches of squiggles inside the room (in fact, questions written in Chinese). Upon becoming proficient, a Chinese speaker outside the room could not tell that the person within the room does not know Chinese. Searle then claims that a functionalist would have to say that such a person effectively can communicate in Chinese, although clearly that person has no understanding of Chinese. The

objection from phenomenal properties thus re-emerges in a slightly different guise.

The final identity theory we consider is that of Donald Davidson[31]. As mentioned above, he defines what it is for an item to be mental through reference to intentionality. He then formulates three principles. First, the Principle of Causal Interaction states that some mental events, at least, cause physical events, and vice versa. Secondly, the Principle of the Nomological Character of Causality states that wherever there is causality, it must be expressible via a causal law. Finally, the Principle of the Anomalism of the Mental states that, because of intentionality, no laws may explain or predict mental events. These three, apparently contradictory, principles lead Davidson to a sort of dualism he calls anomalous monism. Mental intentionality results in two different kinds of vocabulary, one of which formulates scientific laws, and the other which is unsuitable for making law-like statements. Yet, Davidson writes,

> "although the position I describe denies that there are psychophysical laws, it is consistent with the view that mental characteristics are in some sense dependent, or supervenient, on physical characteristics."[32]

How this theory might practically be understood is not clear, however, since it is more of a statement of expectation than of explanation. If mental characteristics relate to physical characteristics, and if one physical state is related to another by law-like causal statements, it is difficult to see how there can be no laws relating successive mental states. As Teichman points out, there is a difference between a dualism of description and a dualism of explanation, and indeed it is this which lies at the heart of problems of formulating an adequate theory of explanation in opposition to epistemological reductionism.

(e) The relationship of mind, brain and God

The above constitutes no more than a glance at the contours of some of the recent approaches towards a mind-body theory which affirms physical monism. A full assessment of their merits is clearly beyond the scope of this work, especially since it is immediately apparent that none of them are without considerable problems: the mind-body problem is still the centre of lively debate. But one may

discern one characteristic towards which the theories are inclining. That is an irreducibility of description between the mental phenomena and the physical descriptions: a certain looseness of fit between the two, one might say. This is shown by the variable realizability inherent in functionalism and the dualism of description used in Davidson's theory. The powerful objection from phenomenal properties also points towards a gap between the present-day physics of the brain and the experience of the mental, thus placing physical monism under strain. However, at the same time, these theories exhibit the refusal to countenance a Cartesian dualism we have noted is characteristic of modern anti-reductionism. So what implications might this have for an understanding of God's interaction with the world?

To begin with, we have seen above that the division between the mental and the physical is not easily defined. It seems that the simplest working definition for the physical is that which obeys law-like principles determined in science. Such a definition, however, appears to be an inadequate foundation for the questions with which we are dealing, at any rate without further substantiation. Its major weakness is its circularity: physics sets out to discover the laws of nature, and in so doing disregards any non-law-like behaviour. But this does not need to mean that science regards only that which obeys natural laws as being physical reality. Indeed, we all have a notion of what is physically real which is quite independent of whether it obeys laws or not. Also, construing physical monism to mean that the contents of the world obey laws is quite different from construing it to mean that there is only one category of substance in the world. If physical monism leads to problems understanding how God can be immanent in the world, then it must be clear whether or not this arises only from assuming that to be physical is to obey laws.

Having stated that, however, it has been conceded that a motivation for physical monism is the success of modern science with its law-like generalisations. Can the difficulties we have reviewed above of maintaining such a tight brand of monism whilst allowing for our experience of freedom in the mental be exploited in understanding how God could be present in such an environment? Could this be a way of holding a physical monism of science whilst allowing God's interaction via some sort of mental inspiration? Regrettably, I suspect

that the answer is no: let us consider each of the three classes of theory mentioned above.

First, the physicalist theory is easily disposed of as giving no possibility of God's communicating with mind without directly changing the corresponding physical brain state, since the two are identical. In this case, therefore, God can only communicate with his universe by direct intervention, overcoming his own created laws, which is the outcome we had hoped to avoid. We may also note parenthetically that, if the physical is defined to be merely the law-like, it is then not possible for God to intervene without thereby destroying the physical.

Secondly, functionalism, although it is much freer in its identification of mental items with particular physical states, nevertheless maintains in any particular instance such an identity. So far as God's communication is concerned, therefore, the case is the same as with physicalism.

The most promising theory to consider is mental anomalism, where it is claimed that physical law-like causality does not need to imply a similar constraint upon the mental, exploiting an anti-reductionist approach. Not surprisingly, therefore, this theory appears most amenable to a theistic understanding of the world with direct divine communication, albeit with a degree of caution: the theory itself does not seem to get to grips with explicating how mental life may in fact wriggle free of the causality inherent in its physical substratum.

In order to illustrate the situation, consider someone whose mind is in some state P and whose brain is correspondingly in state π. Suppose that this state involves the making of some choice, so that shortly afterwards the mind is either in state A (with the brain in state α) or in state B (with the brain in state β). It does not matter for our purposes whether a brain state uniquely determines the mind state or not. In this formulation, Davidson is asserting that (abbreviating the notation) from π one cannot deduce whether α or β will follow; one can only begin to make such a deduction from knowing P. Say that, after the choice, the mind is in state A, so that in fact π is followed by α. Then one cannot explain $\pi \rightarrow \alpha$ directly, but only via $\pi \rightarrow P \rightarrow A \rightarrow \alpha$ irreducibly. A physical description alone is not

sufficient.

Now we are in a position to clarify what we require of divine interaction. Such interaction must not affect directly the evolution of π to α or β, since this would involve the physical intervention by God which we wish to avoid. If, however, divine interaction could influence whether A or B is the outcome from P without a physical interaction, then we would have achieved our object of conceiving how God can act without violating physical law. But this is precisely wherein the ambiguity of Davidson's proposal lies: is it a matter of description or of causality that we have to take the route π -> P -> A -> α irreducibly? It would seem to be the former. As we have seen, the recent moves against reductionism are concerned not with any inadequacy in assuming that the world is constructed out of some elementary matter, but with epistemological reductionism and the inability to express certain higher level theories in terms of lower level theories. Denying epistemological reductionism does not thereby enable us to conceive of some nexus of causation apart from the physical. Mind is supervenient upon the brain, not completely free of the brain. Therefore any external influence upon the mind is still to be mediated through the mind-matter unity of the brain, which is indivisible.

That is not to deny that our minds may be, in some sense, genuinely free and rational and of a different kind to the brains which are their physical form. Nor is it to deny that God should be understood analogously to our minds. The point at which this conception of God's interaction fails is its suggestion that two minds (even where one of them is divine) can communicate directly with one another in isolation from any physical factors. Telepathy would seem to be a logical impossibility, at any rate in the absence of some underlying physical process.

The notion has been used of level autonomy in describing the relationship of the mind to the brain, or vice versa, in order to make plausible the ability of the mind to roam free of the causal network which is the brain. But this is a descriptive autonomy, not an ontological autonomy. Thus it is one thing to say that one cannot *describe* the mind in terms appropriate to the lower-level interactions of the brain; it is quite another thing to say that the mind is not

constituted by a complex amalgam of those lower-level interactions.

As an illustration which in important respects parallels our discussion, we may consider a tape recorder playing a tape of a Beethoven symphony. There is no doubt that this constitutes a purely mechanical system whose workings can readily be described using only a physical vocabulary: a magnetic field, previously imprinted upon a ferro-magnetic tape, is converted to a varying electrical signal, which in turn is converted by a loud speaker into mechanical oscillations in the surrounding air. On the other hand, there is equally no doubt that the resultant sound - that of a Beethoven symphony - cannot be described in terms of the vocabulary of physics. One may list the frequencies of the various portions of the sound in the order that they occur, but that of course does not approach a true description of the music. Thus, such a tape recorder is a simple example of a system which is entirely constituted by lower-level, physical elements, but which nevertheless is not fully describable in those terms. But it would be a mistake thereby to conclude that it is conceptually possible somehow to interact with the music without at the same time interacting with the physical system which constitutes it. It may be said, of course, that the music does indeed interact at a higher level with the mind of the one who hears; that is correct. Yet the analogy is formed with the tape recorder corresponding to the human mind, and the mind of the listener corresponding to God. As God is said conceptually to be able to interact with our minds, then, in the analogy, it must be that the listener is able to affect the music as produced by the tape recorder. That is clearly only possible with some form of physical interference with the tape machine. Even though the tape recorder exhibits an irreducible emergent property (the Beethoven symphony), nevertheless no interaction is possible which bypasses the physical lower levels of the system.

In treating the mind as an emergent property of an advanced nervous system, it is tempting to understand the mind as having gained some sort of causal freedom from the brain. That is misleading in the context of the contemporary theories of mind and brain with which we have been concerned. It is not that either the brain causes the mind, or indeed that the mind causes the brain. Rather, brain

and mind are two different descriptions of one and the same reality; emergence is in no sense a term of independence. Thus, it is not even conceptually possible for God to interact with one level of description rather than another; there exists only one reality with which he may interact and the causal basis of that reality remains physical.

(f) Conclusion

One may sometimes be tempted to assume that anything which places a question mark against science's omnicompetence must make it easier to advance a theistic understanding of the world. At first sight, this appears to be especially so of the recognition that scientific reduction is not sufficiently subtle to lay claim to the whole truth about the complexities of the universe. There is more to the world than the interactions of atoms; there are aspects to life of which the discipline of physics can know little, if anything.

This is undoubtedly very significant, but it is dubious whether it is of help in conceiving of God's action in the world in a traditional sense. For the foundations of this anti-reductionism are firmly anti-dualist, with the consequence that God's interaction necessarily remains outside its scheme so long as God himself is conceived in dualistic terms. Anti-reductionism's attraction is precisely in promising an understanding of how this complex world may nevertheless be built up from the simplest of foundations. In particular, modern theories of mind aim to understand the irreducible characteristics of the mental as arising from a physical substratum, not from some other source.

Thus the dismissal by Wiles of the claims of Goulder and Hall, with which we began this chapter, does not convince to the extent that it seeks its support from modern scientific views. It may be true, as Wiles asserts, that we need not commit ourselves to a physical determinism in the relationship between brain and mind, the latter dragged along by the former. But this enables us to say neither that the mind is therefore independent of the brain, nor that it can be free in its interactions, save through the medium of the physical.

Although the recognition of the inadequacies of reductionism

thus cannot overcome at a stroke any of the difficulties in conceiving divine interaction against the background of modern science, nevertheless the insights won contribute towards a wider scientific picture of the world presently gaining currency. In this, matter is viewed as being more fecund than previously imagined: not the dead and dry constituent of mechanical processes, but active and creative. The emergence of new properties, indeed of life itself, is then understood as nothing less than the inevitable realization of matter's natural potential.

Some recent writers have made great use of this newer picture of our world, also incorporating anti-reductionist concepts. It is to this wider scheme that we turn in the following chapter.

Chapter 6: Modern Science as an Opening for Divine Interaction

In the previous chapter we saw how reductionism in science is now treated with greater caution and considered some of the implications this may have for a theistic view of the world. However, the unease with reductionism forms only part of recent developments in science, to which we now turn. Through the course of the twentieth century, it has become apparent that the mechanistic view of classical physics is merely a simplified approximation to physical reality. Classical physics remains valid in many circumstances, yet it is inadequate even to understand the workings of a modern radio.

The importance of this development is difficult to overstate. Not only has it changed the outlook of physicists, it has also begun to change the perception of the world by society in general. Much of the history of modern Western thought has been driven by an alienation between the arts and sciences, engendered by the success of the mechanistic world-view. It might even be said that humanity grew to be alienated from the universe: the former was aware of beauty, love and value, whilst the latter appeared to be indifferent to humanity's values and existence.

Such alienation is detectable in the work of Jacques Monod which we consider below. However, more recent science has begun to overcome this alienation. An extreme reaction against classical physics is seen in the work of Fritjof Capra, to whom we also turn. Whilst perhaps overcoming a perceived barrier between animate and inanimate matter, however, the religious effect of these developments is less straightforward. A perception of a unity between humanity and the rest of the world may draw one towards a mystical monism, but this is far from the Christian notion of the world as being, at least in part, the arena for God's action. In the latter part of this chapter we therefore investigate the thought of John Polkinghorne and Arthur Peacocke who propose conceptions for specific divine action.

(a) Jacques Monod and a creation without meaning

Jacques Monod's influential book, *Chance and Necessity*[1], considers the implications of modern molecular biology in a popular Darwinist account of the genetic mechanism. The biochemical mechanism uncovered by the pioneering work of Crick and Watson turns out to have two crucial properties, so far as Monod is concerned. First, the mechanism is apparently entirely explicable in terms of chemistry. Thus, it is argued, reductionistic science shows itself capable of laying bare seemingly the most complex and mysterious of phenomena, even life itself. Secondly, it is demonstrated that this mechanism allows the generally accurate reproduction of genetic material in cell replication ("necessity"). Yet random genetic mutations also occur, resulting in the pool of genetic variety from which natural selection may draw ("chance"). Thus, the evolutionary hypothesis is supported.

Monod's description of molecular biology is compelling. However, it is not without polemical intent, corresponding to the two aspects noted above. First, Monod asserts that science is the only means to objective knowledge. Secondly he stresses that the evolution of life has followed undirected chance. When the process of evolution started, Monod argues, it would not have been possible to predict its outcome; therefore any notion is false which supposes humanity to be more than an improbable and meaningless accident in the universe. We shall take these two assertions in order.

Monod's view of science is apparently clear; he expresses it in his "principle of objectivity", which states,

> "that nature is objective, that the systematic confrontation of logic and experience is the sole source of true knowledge."[2]

What is meant by "objective" or "experience" is not stated, but Monod goes on to make a distinction between knowledge and values, writing:

> "Knowledge in itself is exclusive of all value judgment (except that of 'epistemological value') whereas ethics, in essence *nonobjective*, is for ever barred from the sphere of knowledge."[3]

Yet there remains for Monod a relationship between values and knowledge:

> "True knowledge is ignorant of values, but it has to be grounded on a value judgment, or rather on an *axiomatic* value. It is obvious that the positing of the principle of

> objectivity as the condition of true knowledge *constitutes an ethical choice and not a judgment reached from knowledge* ... To assent to the principle of objectivity is, thus, to state the basic proposition of an ethical system."[4]

This implies a fundamentally sceptical philosophy, where knowledge arises from an ethic which is itself not true knowledge. If, as we shall see, we are the products of blind chance, nevertheless for Monod that knowledge seems to be gained only in blind faith.

In practice, however, Monod's view of science closely matches that of so-called naïve realism, with the suggestion that science uncovers what is around us in an unqualified way. His treatment of biological evolution is certainly consonant with this.

Yet there are well known difficulties with such an outlook[5]. For instance, any finite set of data is always consistent with more than one theory, so that a choice of theory requires further selection principles. The collection of data is also problematic, since observations are themselves theory laden, especially when built upon other previously established theories. Further, as Monod himself stresses, the fundamental choice of the scientific method is open to the charge of being arbitrary, at least when it seeks to be the sole measure of truth.

In the discussion in chapter three, we suggested that a critical realism is the best interpretation of modern science. This realism is cautious and modifies naïve realism by taking seriously its defects and the uncertainties inherent in any human activity. Quite apart from its adequacy in the philosophy of science, the adoption of critical realism also has implications for the exploration of the relationship between science and the diversity of human experience, for two reasons.

First, accepting a critical realism renders false the absolute distinction which Monod attempts to make between objective knowledge and values. No clear separation can be made between different varieties of knowledge, since each involves the whole spectrum of human experience. But this leaves the way open to incorporating both science and the humanities within the same body of knowledge. Each is limited in its grasp and both are founded upon the same resources of human understanding.

Secondly, science's pre-eminence over other disciplines may

now be subtly overturned. The dominance of science is not caused by the priority of its truth claims, but because it happens to be a relatively simple discipline in its methodology and in the assurance given by its results. As David Bartholomew puts it in the context of theology,

> "...the truth which comes through scientific endeavour is, in a sense, simpler and more easily recognized for what it is than are the more subtle and elusive truths of the spirit."[6]

Monod's view of scientific truth is therefore unsatisfactory. A more inclusive view of the range of knowledge needs to be deployed, since human knowledge forms one whole. The alienating divide between the disciplines of science and the humanities cannot then be maintained.

The second of Monod's assertions mentioned above is that the evolution of life on Earth came about entirely by chance and could not have been foreseen. It is therefore incredible, Monod argues, that anyone should now think that God created the universe as a means of creating humanity.

The evidence is twofold for Monod's conclusion. On the one hand, the sequence of amino acid residues strung together to form a polypeptide protein molecule bears no relationship to the function that molecule has in the organism's metabolism. This follows because a molecule's function is largely determined by its shape relative to other organic molecules, and this shape cannot be predicted from a given sequence of residues: the chain of molecules folds itself up into a three-dimensional ball in a wholly unpredictable fashion. Thus one could not plan beforehand a protein molecule to fulfil any required function. On the other hand, if many proteins are studied, the sequence of amino acid residues in each is found to be indistinguishable from a similar set of proteins constructed by the completely random combination of amino acids. Thus, Monod writes,

> "... protein is already at the molecular level a veritable machine - a machine in its functional properties, but not, we now see, in its fundamental structure, where only the play of blind combinations can be discerned: random chance, caught on the wing, preserved, reproduced by the machinery of invariance and thus converted into order, rule, necessity."[7]
>
> "Pure chance, absolutely free but blind, at the very root of the stupendous edifice of evolution: this central con-

> cept of modern biology is no longer one among other possible or even conceivable hypotheses. It is today the *sole* conceivable hypothesis, the only one compatible with observed and tested fact.
>
> "There is no scientific position, in any of the sciences, more destructive of anthropocentrism than this one, and no other more unacceptable to the intensely teleonomic creatures that we are."[8]

Mary Midgley has written of a new puritanism in our scientific culture, which requires us to believe the worst about our situation in the universe[9]. We are told that we must look with clear heads at the facts presented to us and not flinch from drawing uncomfortable solutions: if we find comfort, then we have most probably erred in our reasoning. Monod, too, finds a nobility in facing the bleakness of our existence, but the question is whether he himself has been influenced by such a puritanism. As we shall see, Bartholomew, for one, does not find Monod's case convincing.

One approach in answering Monod is to question what might be involved in 'pure chance'. Chance is the description of events where no cause is apparent, so that it might appear meaningless to attribute anything to chance as an explanation. Donald MacKay uses this to argue that nothing in fact happens without God's direct doing and hence evolution is fully within his providence[10]. The penalty, however, of such a logically coherent approach is the further difficulties it entails for understanding human freedom, as we mentioned in chapter four.

Bartholomew, in his reply to Monod, chooses another route by not denying there is such a thing as chance. Where two independent causal sequences interact unexpectedly, this is chance. For instance, if, when in Australia, I should happen to meet a friend who also normally lives in England, then this is a chance occurrence despite the fact that there is nothing mysterious in the causal chains which led each of us to travel to Australia unknown to the other. Bartholomew is agnostic whether 'pure chance' may also exist, such as that envisaged in some interpretations of quantum theory. Yet, although chance exists, Bartholomew argues that it is consonant with order when considered in aggregate. One of many examples he considers is the operation of market forces where random choices by individual consumers nevertheless gives rise to predictable outcomes as a whole.

This leads him to make the suggestion that chaos and order are complementary: one implies the other[11]. Now a way is clear in the reply to Monod's case. The precise route taken by evolution from inanimate matter to higher organisms may indeed be random, but this does not imply that the outcome itself is necessarily random. In the same way that molecules in a gas move randomly whilst the gas as a whole nevertheless obeys the gas laws, so the outcome of evolution might actually be determined. So long as we view evolution as a process involving the chance interactions of individual molecules, we are liable to be incredulous at the notion that there was anything inevitable about the whole process. But it is possible to look on a larger scale where individual chance behaviour results in highly ordered structures.

The argument that the outcome of the evolutionary process was inevitable does not depend upon any belief in a creator God; it is a fully scientific hypothesis. Whilst David Bartholomew explicitly promotes a theistic understanding of the universe, Ilya Prigogine and Isobelle Stengers do not. Yet whilst Monod writes:

> "The thesis I shall present in this book is that the biosphere does not contain a predictable class of objects or of events but is a particular event, certainly compatible indeed with first principles, but not *deducible* from those principles and therefore essentially unpredictable,"[12]

Prigogine and Stengers state:

> "We are tempted to go so far as to say that once the conditions for self-organization are satisfied, life becomes as predictable as ... a falling stone. It is a remarkable fact that recently discovered fossil forms of life appear nearly simultaneously with the first rock formations."[13]

The basis of Prigogine and Stengers' intuition is their work on so-called dissipative systems. The second law of thermodynamics states that entropy, a measure of disorder, must always increase with time. This would seem to condemn the universe to decay as the highly ordered matter of living systems cannot forever survive. However, whilst this law may be valid for the universe as a whole, it does not preclude regions of decreasing entropy if these are suitably balanced by an increase of entropy elsewhere. Life on Earth is one such pocket of increasing entropy which is maintained by exchanging energy with other regions; it is known as a dissipative system.

Dissipative systems exist far from equilibrium with a consequence that they are more difficult to analyse mathematically.

Classical physics concerned itself almost entirely with equilibrium situations; only more recently (especially since the advent of computers) have non-equilibria been studied and a new range of unexpected phenomena come to light.

The mathematical description of many of these phenomena is included under the general heading of chaos theory. This is the class of mathematical equations whose solutions are exquisitely sensitive to the input variables. They have the characteristic that, for two different opening values no matter how numerically close to one another, the solutions diverge. A common example of a physical system described by such equations is the weather. It will never be possible to forecast the weather more than a few days in advance, for beyond that interval the minutest of effects (such as the flapping of a butterfly's wings, it is often said) would change the resultant weather patterns beyond recognition. A further example is the prediction of the positions of molecules in a gas. Picturing a gas as a collection of billiard balls bouncing off one another, then the position of any molecule after a short time interval is highly sensitive to the exact angles of collisions with other molecules within that time. A typical molecule undergoes fifty collisions in 10^{-10} seconds; even after that time, the outcome would be affected by the presence of the gravitational field due to a single electron at the other side of the universe[14].

It is this unpredictability which suggested the name chaos theory, although the mathematical equations themselves remain entirely deterministic. There is no contradiction between accepting chaos theory and believing the world to be deterministic. Chaos theory is a misnomer, furthermore, if the name suggests that the outcome of such equations is truly chaotic. There is an element of randomness, but this is only a cloak for some highly structured behaviour. In certain conditions, these equations can produce the most surprising of results.

One such phenomenon studied by Prigogine is a chemical clock[15]. This consists of two chemicals, say A and B, mixed together and undergoing certain reversible reactions which change A to B and vice versa. It is found that, for certain initial concentrations, a remarkable cycle is set up spontaneously. After a certain time, the chemical clock switches from being almost entirely A to being almost

entirely B and after another length of time reverts to being A. The timing of this cycle remains constant. There is no gradual change from A to B and back again, but billions of molecules change from one type to the other in a co-ordinated jump.

Nothing mysterious is happening in such systems which is not understood by physics. Rather the type of dynamics which a few decades ago was assumed to lead to predictable and uninteresting results is now found in certain circumstances to lead to complex and unexpected behaviour. As the complexity of the systems increases, new behaviour constantly comes to light. Prigogine and Stengers summarize their findings:

> "Order and disorder are complicated notions: the units involved in the static description of dynamics are not the same as those that have to be introduced to achieve the evolutionary paradigm as expressed by growth of entropy. This transition leads to a new concept of matter, matter that is 'active', as matter leads to irreversible processes and as irreversible processes organize matter."[16]

We have taken Monod as illustrative of a traditional view of science. He maintains a barrier between the humanities and science, taken to be an heroic choice of ethic, finding the life-forms of the world to be unpredictable and arbitrary. As Monod writes of the idea that "objective knowledge" is the only source of real truth:

> "Cold and austere, proposing no explanation but imposing an ascetic renunciation of all other spiritual fare, this idea could not allay anxiety; it aggravated it instead."[17]

Other scientific authors take a similar point of view. For instance, the physicist Steven Weinberg has written:

> "The more the universe seems comprehensible, the more it seems pointless... The effort to understand the universe is one of the very few things that lifts human life above the level of farce, and gives it some of the grace of tragedy."[18]

This fundamental pessimism is beginning to look misplaced, however. Not only is the scientific endeavour not to be isolated from the rest of human learning, thus perhaps removing all values from human life, but modern science is also beginning to see the organic complexity needed for life as being spontaneously generated by the universe. Human life is not a miracle beyond comprehension in an alien universe; rather, life is the natural outcome of active and creative matter. It is this shift in perspective which has been so important in these last few

decades. At the core of this shift is the realisation that chance may be generated even in a Newtonian world, but that such chance is not corrosive of stability: rather, it may actually be the means of large-scale order.

(b) Fritjof Capra, physics and Eastern mysticism

Fritjof Capra exemplifies a position at the other end of the scientific spectrum from Monod. He is of interest through his religious response to modern physics which he believes enables him to bring about a unity between science and other areas of human life. He writes of an experience at the heart of his vision of the world:

> "I was sitting by the ocean one late summer afternoon, watching the waves rolling in and feeling the rhythm of my breathing, when I suddenly became aware of my whole environment as being engaged in a gigantic cosmic dance... As I sat on that beach my former experiences [of theoretical physics] came to life; I 'saw' cascades of energy coming down from outer space, in which particles were created and destroyed in rhythmic pulses; I 'saw' the atoms of the elements and those of my body participating in this cosmic dance of energy; I felt its rhythm and I 'heard' its sound, and at that moment I *knew* that this was the Dance of Shiva, the Lord of Dancers worshipped by the Hindus."[19]

Capra's thesis is that there is a close parallel between the insights of Eastern mysticism and the insights of modern physics, both pointing to a unity and interrelatedness of all things.

Rather too easily[20], Capra suggests that the basic teachings of all the mystical religions are the same, namely that reality is a unity beyond any rational capability we may have to grasp it. Ultimate reality - the *Brahman* of Vedantic Hinduism - is the oneness of all things, a unity hidden by the illusions to which we are prey. Yet modern physics, especially in its development of relativistic quantum field theory, points in the same direction, Capra contends: it reveals the basic connectedness of all things in a way which stretches our imaginations and which suggests that what we observe under normal circumstances has no relationship to the underlying quantum reality.

There are numerous difficulties with Capra's presentation of his ideas, arising largely from a contradiction between mysticism's unapologetically non-rational view of the world, and the view of phys-

ics derived from a strictly rational discipline. For instance, Capra states that mysticism understands reality to be indeterminate and undifferentiated[21], yet as a product of its mathematical methodology, modern physics unavoidably sees reality to be structured, in however strange and wonderful a way.

Additionally, quantum theory does not always tie in as neatly with mysticism as Capra assumes. The interpretation of the mathematical formalism of quantum theory remains a matter of controversy, with the widely-taught Copenhagen interpretation proposed by Neils Bohr vigorously opposed by some and viewed as unsatisfactory by many[22]. Problems arise because quantum theory involves the conjunction of two different procedures. In isolation from an observer, a wave-like quantum system evolves in accordance with wholly deterministic equations. Only with an observation are particles reified, when the wave equation is used to calculate the probability of a particle being found in any particular location and state.

The Copenhagen interpretation insists that this is the way nature is: that particles are only made "real" in the act of our observing them. However, what is so perplexing about this interpretation is what constitutes an observer. The Copenhagen interpretation divides an experiment into the observational apparatus, which is describable by classical physics, and the object of the observation which is not. But when an electron, say, is detected, it is surely detected by a part of the apparatus which is itself subject to quantum theory, so that a division between classical and quantum elements appears arbitrary.

This awkward division has led some, such as David Bohm[23], to propose theories whereby particles have a real existence all along. It must be said, however, that such theories themselves seem mathematically contrived. Others believe that the "collapse of the wave function", as this strange phenomenon is known, must be caused not by the observation as such, but by other large-scale and as yet unknown factors; for instance, it has been proposed that it is caused by gravity[24].

Capra, however, is happy that the observer plays a fundamentally important role. He quotes with approval Eugene Wigner's controversial proposal that the distinguishing factor about the

observer in quantum theory is his or her consciousness[25]. Thus Capra writes:

> "In modern physics, the universe is thus experienced as a dynamic, inseparable whole which always includes that observer in an essential way. In this experience, the traditional concepts of space and time, of isolated objects, and of cause and effect lose their meaning. Such an experience, however, is very close to that of the Eastern mystics."[26]

It may be felt that the invocation of some metaphysical concept of consciousness to settle a scientific question is unwarranted; neither does it solve some of the paradoxes of the theory. For instance, the result of a quantum measurement might be recorded by a photograph. But prior to developing it for conscious observation, Wigner would seem to have to say against all intuition that the photographic image remains indeterminate.

Even should we accept Capra's assessment of quantum theory, it is not clear where these ideas are leading. For it would seem that introducing an essential division between observer and observed creates a dualism which Capra is anxious to avoid. It is confusing to find him writing,

> "the Cartesian partition between the I and the world, between the observer and the observed, cannot be made when dealing with atomic matter. In atomic physics, we can never speak about nature without, at the same time, speaking about ourselves."[27]

It would only seem that Capra's argument must end in a form of idealism, although he never states this and nothing in his view of physics suggests it.

Capra's thesis therefore does not stand up to close inspection. It is never quite clear what is the exact relationship between mysticism and physics for which he is arguing. Yet his work is an illustration of a changing perception of modern science, not only in the biological sciences but also in physics. Capra states:

> "This book aims at improving the image of science by showing that there is an essential harmony between the spirit of Eastern wisdom and Western science. It attempts to suggest that modern physics goes far beyond technology, that the way - or Tao - of physics can be a path with a heart, a way to spiritual knowledge and self-realization."[28]

There is here the recognition that science has lost much of its pre-

stige even whilst its truth-claims go largely unchallenged. But what is of significance is not whether its image may be improved by an association with mysticism, but that a physicist should feel able to describe the world in a way which makes that association possible. As in the work of Prigogine and Stengers above, matter is no longer seen as lifeless, but as energetic and vital. The barrier is being dismantled between humanity's spiritual existence and a universe once seen to be spiritually barren.

The recovery of a view of the natural world as being inherently life-giving and sympathetic to human life is significant in a scientific context, but such a view is, of course, neither historically new nor specifically Christian. The enchantment of nature is an ancient religious instinct revived to some extent in the West by the Romantic movement of the last century. Although, as Capra argues, such a vision may appear compatible with mystical religion, this is because mystical religion itself has a tendency towards pantheism. In short, the new outlook of science can be used to justify a return to the religious concept of Mother Earth.

This is perhaps best illustrated through the controversial work of James Lovelock. His Gaia hypothesis emphasises that the Earth possesses a complex feed-back mechanism by which the biosphere compensates for any environmental changes. It is suggested that in this way the biosphere nurtures and protects life by evolving alongside the life forms themselves. Although Lovelock denies that this is anything more than a scientific hypothesis, his own picturesque use of language frequently suggests otherwise. Thus he writes:

> "... Gaia is the largest manifestation of life. The outer boundary is the Earth's atmospheric edge to space. The boundary of the planet then circumscribes a living organism, Gaia, a system made up of all the living things and their environment."[29]
>
> "When I first saw Gaia in my mind I felt as an astronaut must have done as he stood on the Moon, gazing back at our home, the Earth. Thinking of the Earth as alive makes it seem, on happy days, in the right places, as if the whole planet were celebrating a sacred ceremony."[30]

It is not surprising that Lovelock's ideas are popular with the New Age movement[31]. However, whilst acknowledging the controversial nature of the Gaia hypothesis and its lack of respectability in the

scientific community, its importance from our point of view is again the readiness with which consciously scientific reasoning has been used to support what develops into essentially a religious view of the world.

The question is therefore whether this rapprochement between science and some element of spiritual awareness may garner fruit in the understanding of God's action of the world. Lesslie Newbigin, however, has sounded a perceptive warning note in the Christian context when he ponders why the Eastern religions should enjoy popularity in our Western scientific culture:

> "The reason is clear. The Eastern religions do not understand the world in terms of purpose. The symbol of the dance is an interpretation of movement and change without invoking the idea of purpose. The Bible, on the other hand, is dominated by the idea of divine purpose."[32]

Mysticism tends to emphasise the unity of all things, but less easily envisages either an historical purposefulness or an eschatology. This is clearly congenial to the modern scientific outlook which may also see the universe as a fruitful and interconnected whole, whilst shying away from any teleology. But it is doubtful whether a traditional Christian theism can take such a view. There is indeed a Christian mystical tradition, but even here there is an element of purposefulness: the burgeoning of new resurrection life directed towards the incoming of the kingdom of God, the *telos* of the creation. Christianity believes God to be both transcendent and immanent; whilst the new openness of science may allow us to conceive more readily of some immanence of God in creation, problems of how a transcendent God may interact with his world are not addressed. There is still a further step to be taken in bringing God and creation together.

One way in which some have attempted to bridge this gap is by associating teleology entirely with God's immanence, allowing the processes of creation to have their own inner purpose. We shall discuss this, the approach of process theology, in the next chapter. At present, however, we shall consider a more traditional theism and, in the thought of John Polkinghorne, one who wishes to retain in Christianity both providence and miracle in their full senses.

(c) John Polkinghorne and the emergent simplicity of physical laws

In considering divine interaction with creation, Polkinghorne has two related concerns. First, he perceives a danger that too great an emphasis on natural theology may lead one into deism, viewing God merely as the Great Mathematician[33]. For Polkinghorne, science is by no means to be the highway to God, but must be carefully balanced by the other resources available to a theologian:

> "It is, of course, clear that natural theology by itself could never lead us to the Christian God. It is a limited kind of investigation, based on certain general ideas about the pattern and structure of the world, and so it is only capable of affording limited insight."[34]

Secondly, however, Polkinghorne eschews any view of God as a supernatural agent working in defiance of physical law. He writes:

> "The picture of the divine clockmaker, from time to time interfering to adjust the hands of the steadily ticking cosmic clock, is not one that commends itself to Christian theology. God's relationship with the world must be continuing and not intermittent; it can have nothing capricious about it, but it must be characterized by the most profound consistency."[35]

Polkinghorne has a high regard for the regularity of the world, which is the deep-seated faith of all scientists. Indeed, it is in this regularity that Polkinghorne sees a reflection of the rationality and faithfulness of the universe's creator. Yet, between Polkinghorne's two proper concerns to protect Christianity from deism and to take full account of the world's regularity, there is a fundamental tension. That tension lies at the centre of the problem of conceiving of God's action: the more one emphasises the regularity of nature, the more one is inevitably led to think of God as the Great Mathematician. We shall see that Polkinghorne does not escape this inherent contradiction.

In attempting to gain an understanding of how God's providence might work within the continuing world of physical interactions, Polkinghorne dismisses the possibility that quantum uncertainty might provide the key. He agrees with Bartholomew that what may be random on one level is in any case highly ordered on another, the principle upon which actuaries make their livings; also, the effects of quantum uncertainty are lost at the levels we experience in the world[36]. Rather, Polkinghorne looks towards complex dynamical sys-

tems, those described by chaos theory, as a more promising field.

As we have seen, these systems have the properties both of being unpredictable and also of having large scale and sometimes stable behaviour such as Prigogine and Stengers' chemical clock. Polkinghorne finds the structured openness of these dynamical systems to be suggestive of how human agents themselves experience their freedom in the world. Analogously, he tentatively proposes, the cosmos might be capable of sustaining the "acquiescent, economic and purposive wills of its Creator, within the flexibility of its lawful process."[37]

This is the recasting of the soul-body/God-world analogy of divine action into a modern form, avoiding the difficulties of Cartesian dualism. However, if it is to bite, it must provide some understanding of how God interacts with his world without the directness of action exhibited by creatures. We ourselves may have freedom of action, but we act from within the physical system, subject to the constraints of energy conservation and so on. Yet if God's actions also involve the transfer of energy, in principle detectable by experiment, this would be the type of intervention which Polkinghorne resists.

To illustrate the manner of God's interaction, Polkinghorne considers a bead precisely balanced at the top of a vertical U-shaped wire. It may fall either way depending upon how it is infinitesimally disturbed, without any energy difference to make it more likely to fall one way than another:

> "That is typical of much more complicated cases. If God acts in the world through influencing the evolution of complex systems, he does not need to do so by the creative input of energy. Of course, such divine energetic interaction is not to be excluded theologically, and it could be so hidden in complex process as not to be perceivable scientifically, but we have no need to invoke it. Moreover, it is probably wise not to do so, since it would risk turning God into a demiurge, acting as an agent among other agents."[38]

There appears to be three areas of weakness, however, in this suggestion.

First, the fact remains that chaos theory is deterministic. Polkinghorne is himself clear about this, but believes nevertheless that the manner in which it gives rise to apparently random behaviour points to a broader reality. In a later book in which Polkinghorne

attempts to clarify his position, he writes,

> "...it seems to me to be a coherent possibility to interpret the undoubted unpredictability of so much of physical process as indicating that process to be ontologically open.
> "The option is there, but it is not, of course, a forced move to choose it. The case for doing so is greatly enhanced if one acknowledges the necessity of describing a physical world of which we can see ourselves as inhabitants."[39]

But this is to undermine the strength of his own case: contemporary science may be suggestive of a greater reality, but that reality is not yet a part of present science. In relying upon a possible development of scientific insight, Polkinghorne thereby appears to concede the insufficiency of science as it is presently understood to admit of divine action.

Furthermore, what that development must entail is not clear. Polkinghorne argues, as we have seen, that in certain physical situations several of the possible outcomes involve the same amount of energy. Thus it is suggested that God might act by favouring one of out of these energy-equivalent results, whereby,

> "the 'choice' of path actually followed corresponds, not to the result of some physically causal act (in the sense of an energy input) but rather to a 'selection' from options (in the sense of an information input)...
> "I do not believe that God is contained within the mind/matter confines of the world, but it is entirely conceivable that he might interact with it (both in relation to humanity and in relation to all other open process) in the form of information input."[40]

The concept of information has become of interest in science recently largely through work on computing systems and artificial intelligence[41]. Yet in any example of making a choice over the future of a physical system, it is nevertheless doubtful whether anyone could ensure a desired result without some energy input, however slight. The bead falling off the top of a U-shaped wire needs some impulse to move one way or the other, otherwise it would remain static. Polkinghorne seems to envisage a situation where no energy at all is needed on God's part, but talking of information input does nothing more than hide the problem of how this can be.

A second weakness in Polkinghorne's proposal is its dependence upon small, microscopic effects having macroscopic

consequences. To take a simpler case first, William Pollard has proposed that God's providence is made present in the world by his so manipulating sub-atomic events that, in aggregate, the statistical laws of quantum theory are not violated[42]. There are a number of difficulties with this view, amongst which is the necessity for truly random events to lack any correlation between themselves. If God is actually to maintain such a degree of randomness in his sub-atomic dealings, it is not possible to arrange any particular outcome.

However, another objection is made by Bartholomew[43], who argues that the product of any such action by God would be beyond even his control. For each time God were to rig, so to speak, the outcome of a microscopic event, the causal chain so started would also intersect with other chains leading to unlooked for coincidences and sparking off various accidents. It could be argued, of course, that an infinite God could cope with all these interconnecting chains of events, but one would wonder whether that might be a logical impossibility. Any one chain of events, when worked through to its conclusion, might make another chain of events impossible. Even were this to prove not to be the case, such action from the lowest levels would be highly inefficient and leaves one feeling that it is too inelegant to be worthy of an infinite God.

Polkinghorne's proposal is not the same as that of Pollard. Rather than a multitude of sub-atomic events being controlled in order to guarantee a particular outcome, Polkinghorne's scheme might only require one minimal event to select a macroscopic outcome in a complex dynamical system. Nevertheless, surely a similar objection is valid. Chaotic systems are highly sensitive to their environment, which means that if God guided the evolution of one system, it would trigger countless effects elsewhere and these effects would often be inherently unpredictable. If chaotic events are unpredictable by us, they would have to be predictable by God in order to be of use to him.

Now, what should be within God's omniscience is a question too large to be entered upon here. Suffice it to say that Polkinghorne himself accepts a position whereby God freely limits himself within time so that he cannot know the future where this is not logically possible[44]. This conclusion is reached from arguments concerning the free evolutionary development of the world and the necessity

of its maintaining a degree of real freedom apart from God. Thus the defence would not be open that God infallibly knows the future in any case; rather, it strengthens the insistence that the future is open and unpredictable. So it is uncertain that, even were the mechanism of information input available to God, he would be able to use it with assurance.

A final weakness in Polkinghorne's case concerns his contention that God does not intervene, but interacts with his creation. It is doubtful whether this distinction is actually maintained. For example, Polkinghorne writes:

> "The motions of the solar system are mechanical in nature, with a predictability over long periods of time which permits the construction of almanacs. Thus the succession of the seasons will be guaranteed by transcendent divine reliability and it would indeed be foolish to pray for their alteration. The generation of weather is a much more complex process, within which it is conceivable that small triggers could generate large effects. Thus prayer for rain does not seem totally ruled out of court. In this way one can gain some rough comprehension of the range of immanent action. It will always lie hidden in those complexes whose precarious balance makes them unsusceptible to prediction."[45]

But one may well ask what the difference in principle is between altering the course of a planet and changing the weather: according to Polkinghorne, it seems the only real difference is that we ourselves do not notice the latter. In other words, the physical universe is so structured that God can intervene in some circumstances without our being able to notice. But surely it remains an intervention, whether directly detectable our not.

In his later writing, Polkinghorne develops further his thinking against such criticisms as these[46]. He emphasises more that the openness observed by modern science is actually an indication that reality is far more complex than previously assumed, as we touched upon above. Polkinghorne takes his cue from the failure of reductionism to account for emergent properties, from the bottom up. In fact, he writes:

> "It is by no means clear that this is more than a trick of intellectual perspective. In other words, the characteristics of the elementary level (whether deterministic, or quantum mechanical, or whatever) may be as much emergent properties (in the direction of increasing simplicity) as are life or consciousness (in the direction of increasing

complexity)..."

> "To address the issue bluntly: if apparently open behaviour is associated with underlying apparently deterministic equations, which is to be taken to have the greater ontological seriousness - the behaviour or the equations? Which is the approximation and which is the reality? It is conceivable that apparent determinism emerges at some lower levels without its being a characteristic of reality overall."[47]

This new suggestion, however, which sees present science as a simplified extraction from physical reality, brings its own difficulties.

First, Polkinghorne, in his construction of a natural theology, tries to take full account of modern science, although he is distrustful of too great a reliance. But in the proposal that present-day science is a simplification of reality and thus will be seen eventually to be inadequate, Polkinghorne seems to have crossed the line into allowing his theology to dictate his science. He may be right that science is inadequate, but he can no longer claim that he is doing nothing more than constructing a natural theology within the bounds of contemporary science.

Secondly, we saw in the previous chapter that the rise of anti-reductionism, with new properties emerging from simpler systems, has been primarily driven by a physical monism. But, against such a background, it is not straightforward to say that emergent complexity is merely the reverse side of the coin to emergent simplicity. The assumption which underlies anti-reductionism is of a basic simplicity made plausible by scientific successes, leaving the world's complexity in need of explanation. The assumption of a basic complexity to our universe needs arguing for against such a view. Additionally, whereas the notion of emergent properties has some grounding in science, the concept of emergent simplicity remains merely an empty concept, unless some specific examples may be found to make it credible.

Thirdly, at the heart of his natural theology, Polkinghorne places much weight upon the rationality of the universe as reflecting the rationality of its creator. Thus he has written:

> "The rational order that science discerns is so beautiful and striking that it is natural to ask why it should be so. It could only find an explanation in a cause itself essentially rational. This would be provided by the Reason of the Creator, which establishes the common ground for the observed rationality of the world and the experienced

rationality of our minds, guaranteeing their mutual coherence."[48]

But the force of this assertion is undermined if the rationality successfully employed by science gives illusive results. The insights gained by science would be, in this view, no more than simplifications of a greater reality. It is no longer clear that this greater reality is rational in the manner which Polkinghorne argues is so striking.

Finally, the adoption of this view would not necessarily help in the point which seems to be at issue. However complex physical reality may turn out to be, God would still be intervening in it. To avoid that conclusion would involve going down the road of process theology in which God's will is immanently present within the physical processes themselves.

(d) Arthur Peacocke and top-down causation

The position taken by Polkinghorne, of preserving a traditional theism without wishing to over-ride the energies and causality of physics, seems to have major difficulties which stem from its basic assumptions. It appears that interaction must always be intervention in such a picture, for it presents science as being a self-sufficient description of our world.

Arthur Peacocke believes, however, that a model of the world can be presented in which no violation of physics occurs. This model makes extensive use of an anti-reductionist agenda, and in explicating it Peacocke makes use of two examples in particular.

Peacocke takes his first example from the work of Donald Campbell[49]. Termite colonies have a complex social organization, with different sub-groups of workers having jaws adapted to the work each undertakes. At one level, the biological structure of any termite's jaw is determined directly by the DNA sequences in its genes. Yet it is equally true to say that these anatomical structures have been determined over many generations by the forces of natural selection. Thus, the DNA sequences themselves have been determined by the operation of higher-level laws operating at the level of colonies of animals. Campbell therefore speaks of "downward" or "top-down" causation. This seems to be an example of irreducibility going one

stage further: the composition of the DNA sequences can only be explained by reference to the higher-level laws, not by the biochemical processes involved in their generation.

The second example Peacocke takes of top-down causation is the human person[50]. In one view of human consciousness (although, as we have seen in the previous chapter, only one of many), it is the state of the brain as a whole which determines the state of any particular neurone. Consciousness is a collective, higher-level phenomenon of the brain which prompts, say, an arm to move by top-down causation. A similar case can be made using other views of consciousness.

Peacocke aims to use this notion of top-down causation in conceiving how God acts in the world:

> "According to this suggestion the state of the totality of the world-as-a-whole (all-that-is) would be known only to the omniscience of God and would be the field of the exercise of his omnipotence at his omnicompetent level of comprehensiveness and comprehension... In this model, God would be regarded as exerting continuously top-down causative influences on the world-as-a-whole in a way analogous to that whereby we in our thinking can exert effects on our bodies in a 'top-down' manner."[51]

This model appears to have none of the weaknesses of Polkinghorne's concept of God intimately involved at every point of creation; rather, there is an elegance to the concept of the world being one system with which God interacts as a whole. Additionally, Peacocke is able to give a clear account of what is involved in top-down causation.

Yet, whilst the model is attractive, its simplicity may be deceiving. For by introducing his action at higher levels, the model has the effect of distancing God from the stuff of physical interaction. But this is illusory. In the examples of top-down causation given by Peacocke, at the higher levels it is not a question of no physical interactions being required, but a multiplicity of simple interactions in a complex inter-relationship. Thus, the brain state is described as the totality of all the individual neurones' states. The higher-level activity actually requires more physical interactions than those at a lower level, not fewer.

In a similar way, when one tries to envisage what it would mean for God to interact at a higher level with the world as a whole, it only becomes meaningful by conceiving of God being involved in

many physical interactions at once in a highly correlated way. But now the advantage is less easy to see of this conception over that of Polkinghorne. Both require extensive direct action by God.

Although Peacocke skirts around this problem by talking of God's action as an information input, he does admit it when he discusses where the 'causal joint' might lie:

> "How can God exert his influence on, make an input of information into, the world-as-a-whole without an input of matter/energy? This seems to me to be the ultimate level of the 'causal joint' conundrum, for it involves the very nature of the divine being in relation to that of matter/energy and seems to me to be the right place in which to locate the problem, rather than at some lower levels in the created order at which divine 'intervention' would then have to be postulated with all of its difficulties."[52]

Although Peacocke's model is attractive and reinforces a conception of the world as being essentially a unity, it is nevertheless difficult to understand how it might actually work without a return to all the problems it seeks to avoid. Once more, it seems, a transcendent God is brought into contradiction with self-sufficient physical law.

(e) Conclusion

We have seen in this chapter that there have been significant developments in science in the last few decades, leading to a more subtle view of our universe and its evolution. Amongst other things, life is increasingly understood to be a natural product of our universe rather than an improbable oddity in need of special explanation (although this is not to say that the existence of such a universe is not itself in need of explanation). Thus science can no longer be a primary motivation for humanity to view itself as alien to the universe, spiritually divorced from a deterministic and mechanical environment. Such a view is reinforced by the adoption of a critical realist philosophy of science, in which the full spectrum of human knowledge is acknowledged to be interdependent. Science is now more readily perceived to be friendly to the human spirit and less sceptical.

The recovery of a vision of humanity as belonging in the world can be developed towards religious ends. In particular we have

noted that it is sympathetic either to that mysticism which emphasises the underlying unity of the universe, or to some religious concept of Mother Earth. One might also think that it would be useful in conceiving of divine interaction with our world, when the latter is no longer viewed as spiritually barren.

However, this hope is disappointed. Resulting from its own methodology, the new scientific view continues to eschew any teleology; thus it cannot easily be linked to any sense of universal purpose. One may argue that, in the universe's evolution, we can detect a development towards some end, such as conscious life. Nevertheless, this would be the self-realization of the universe's nature, not a sign of some parallel external purposefulness or guidance. Within the scientific picture, introducing an external agency, even when divine, will always have an air of artificiality about it.

In a sense, this is an obvious conclusion. Accepting a form of scientific realism, then it is not possible to square the circle of proposing some external divine interaction without science itself allowing some derogation of its self-sufficiency. In the work of Polkinghorne and Peacocke, the problem of conceiving of a 'causal joint' between God and his creation is the sign of this. Indeed, the new insights of science which render the universe more friendly to human aspirations are a two-edged sword so far as such theism is concerned. In one way, it allows the burgeoning of a religious spirit; but in another way, it renews the argument which points towards rendering theism, if not deism, a needless hypothesis.

Thus, if this analysis is correct, looking towards further developments within the discipline of science would not help, so long as these developments retain science's autonomy. We have to conclude that these attempts to understand divine interaction whilst retaining a full acceptance of contemporary scientific claims appear doomed to failure. In the next chapter, we therefore turn to an alternative mentioned in passing above: that God immanently brings a direction to his creation from within the processes described by physics. In this case, the metaphysical basis of science is itself changed.

Chapter 7: Process Theology: A Radically Different Approach

In each of the approaches to divine action thus far considered, conceptual problems have been disclosed. Latterly we explored the newly-found openness of the physical universe as a possible door to divine interaction. Yet we nevertheless concluded that to accept the validity of a critically real science involves excluding God's direct activity in the world, for such a science claims to uncover a complete causal patterning.

The theological determinism entertained in chapter four also had its weaknesses. In particular, its understanding of human freedom and the apparent responsibility of God for the evil of his creation were problematic. But there were other difficulties as well. For instance, whilst there are cogent arguments that God is timelessly eternal, nevertheless it is not easy to understand how such a God could interact personally with his creatures. It would seem that an atemporal God creates the whole of the world's history "simultaneously". But we argued that a response is logically consequent to a free act and so cannot be simultaneous with it in creation without limiting any notion of our freedom.

Thus we have found no wholly adequate means of comprehending where or how God may interact with our world. However, process theologians, with whom this chapter will be concerned, present us with another option, a theology whose foundations are motivated by the very difficulties we seem to have come up against.

(a) Process theology's critique of classical theism

Characteristic of process theologians has been their insistence upon the importance of differentiating between a religious belief and the metaphysical tradition by which that belief is formalized. If theism appears to be irreconcilable with other scientific or humanistic beliefs, then it is argued one should question whether that conflict

arises merely through the assumed metaphysic. This is never an easy question, since the metaphysic and the belief influence one another. Nevertheless, it is hardly an exaggeration to say that the mainstream of process theology[1] is convinced that problems of relating God to the world arise exclusively through a mistaken metaphysic. In particular, it is dismissive of the so-called classical metaphysical tradition of theology, originating in Greek philosophy and developed by the medieval scholastics.

This criticism of classical theism is one of the more widely acknowledged achievements of process theology[2]. At its root lies the rejection of the Greek notion that perfection must be static. Now this idea arises from the reasonable supposition that a change in any entity will always be either for the better or the worse. Yet a perfect entity cannot by definition change for the better, nor would it remain perfect if it changed for the worse. Therefore, any perfect entity must be unchanging.

Accepting such a proposition, God in his perfection will be an unchanging being. At the same time, however, Christianity is committed to the biblical idea that, in loving and caring for his people, God is personal. But it is difficult to conceive how an unchanging being can be related to any other being in a personal relationship. If nothing else, relationships appear to involve interaction, and the mutual interaction in a relationship of love would seem to necessitate some effect and hence change in both the parties involved. Now to establish a contradiction in this would demand a more careful analysis than is within our scope. But that traditional theism indeed has problems at this point is suggested by comments taken from Anselm and Aquinas[3].

On the subject of God's compassionate yet passionless nature, Anselm responds:

> "Thou art compassionate in terms of our experience, and not compassionate in terms of thy being."[4]

A point of similar effect is made by Aquinas:

> "Since therefore God is outside the whole order of creation, and creatures are ordered to Him, and not conversely, it is manifest that creatures are really related to God Himself; whereas in God there is no real relation to creatures, but a relation only in idea, inasmuch as creatures are referred to Him."[5]

Hartshorne, amongst others, suggests that such a notion is not ade-

quate. He analyses relationships into two types: internal and external. When a subject observes an object, then the observation affects the subject and the relevant relationship is internal. However, the object (which may be another subject unaware of being observed) is not affected and so is involved in the relationship externally. In this terminology, knowledge of an object is an internal relationship. Hartshorne then criticises Aquinas for developing some such theory of relations, but applying it inconsistently by having God omniscient and yet not internally, but externally related to his creation.

These difficulties are extended when one considers that traditional theology insists that creation is contingent, whilst God in his essence is necessary. Schubert Ogden fails to understand how the chief aim of humankind could be to serve or glorify such a God:

> "The God whom we are thus summoned to serve is, in the last analysis, so conceived that he can be as little affected by our best actions as by our worst. As *actus purus*, and thus a statically complete perfection incapable in any respect of further self-realization, God can be neither increased nor diminished by what we do, and our action, like our suffering, must be in the strictest sense wholly indifferent to him."[6]

Process theologians thus question the religious adequacy of exalting the Christian God as an unchanging absolute at the expense of allowing him a recognizably personal relationship with his mutable creatures. But there is another inadequacy beyond the alleged incoherence of classical theism. Such a God can only lead to atheism in a secular age, Ogden argues:

> "The whole point of secularity is its emphatic affirmation that our life here and now in space and time, in nature and history, is of ultimate significance. Yet it is just this affirmation that a wholly absolute God renders otiose."[7]

We have been misled, claims process theology, by the dominant metaphysical tradition which speaks of substance, being and static perfection. As John Cobb and David Griffin suggest, it is theology's difficulties with relatedness which give the lie to the whole of traditional metaphysics:

> "If the actual things are thought to be static, relations are nuisances, required only by the need to give the philosophy some relevance to the world as experienced; and if things have real relations with each other, and these relations belong to their respective essences, it is difficult to understand how these essences can be unchanging."[8]

It is at least plausible, therefore, that problems of relating divine

action to the world have arisen for metaphysical reasons as much as through strictly theological, or indeed scientific, beliefs. The problem is not that of conceiving of divine action within our particular world, but of conceiving any divine action at all by a God who is, in metaphysical terms, essentially unrelated to his creation.

Of course, even if we accept this to be a true weakness of classical theology, it is not necessarily a cause to reject such theology. Any theological system will have its weak points; the question is whether the system broadly proposed by process theology is better able to conceive God's relationship with the world without compromising other areas of belief. We therefore now turn to the constructive proposals of process theologians.

(b) The basis of process theology's metaphysics

In understanding any intellectual movement, one must be wary of assuming too simple a convergence of the views of the various writers involved. This is equally true of process theology, especially between the two major strands of thought emanating from Alfred North Whitehead and Charles Hartshorne. Nevertheless, in their metaphysical basis, there is a great deal which unites them.

Primarily, there is a shared conviction that the classical tradition is inadequate to deal with the relationships we find within the world, as well as those between God and the world. As sketched above, this inadequacy is traced to Greek metaphysical ideas of substance and being, as applicable both to the divine and non-divine. Plato, as Whitehead emphasised, saw change as inescapably part of our world, yet for him what is most real is that which is most unchanging. Thus the temporal world we see around us becomes more real as it approaches a static perfection. But that is to mislead us, it is argued. Our personal experience of existence is one of change, growth and decay; science, as we have seen in the previous chapter, gives us a view of the world whose underlying structure is dynamic, not static. Thus our world is in reality in process of becoming; where we have come to see permanence, this is merely an abstraction from the constant flux of the world's existence. Whitehead and Hartshorne therefore reverse Plato's notion: what is static is least real and

abstract; what is real is in constant process of change and becoming.

Hartshorne and Whitehead each builds a metaphysic based on such a notion of reality. But there are differences between the two. Hartshorne emphasises that a metaphysic is not empirical; rather, metaphysics belongs by nature with mathematics and formal logic:

> "[Metaphysics'] propositions, if we get them right, are such that denying them makes no sense. No conceivable observation could contradict them."[9]

Whitehead, on the other hand, is more empirical in his approach, imaginatively searching experience for universal structures. This is expressed in his "reformed subjectivist principle"[10], which states that what is real can only be disclosed by generalization from the experience of subjects. In like manner, God too can only be so understood:

> "God is not to be treated as an exception to all metaphysical principles, invoked to save their collapse. He is their chief exemplification."[11]

This contrasts with Hartshorne, for whom it seems aspects of God are not merely an exemplification of metaphysical principle, but virtually constitute such. He writes,

> "I think the definition and existence of God must be treated like an arithmetical proposition: if false, it could not have been true, if true it could not have been false."[12]

Not surprisingly, Hartshorne has made much of the ontological argument of Anselm[13] and his metaphysical system itself more or less entails belief in God. This sense of the inevitability of belief in God is made explicit in the writings of Ogden, one of Hartshorne's students:

> "I now wish to claim that... faith in God cannot but be real because it is in the final analysis unavoidable."[14]

These characteristics of the approaches used by Whitehead and Hartshorne raise important questions. To continue with Ogden and Hartshorne first, it would appear that belief in God merely stems from a correct metaphysical analysis of our situation[15]. Yet the sense of "merely" here could cause concern that belief becomes no more than trivial, or that the concept of God has been so caught in the web of human rationality that it is thereby unacceptably limited. Now, the notion that belief in God could become unavoidable is not in itself too worrying. After all, atheism in its modern sense is unknown in the Bible and, until relatively recently, belief in the existence of God

went virtually unquestioned. It is only in the modern age that believers have become used to the commonplace that God's existence is not to be proved or disproved. That God might once more become an accepted part of our intellectual outlook is no cause for concern.

However, as in any rationalistic theology, the danger that God is cut down to the size of his creatures must be admitted. The question is whether this danger invalidates the theology, for whilst Gunton concludes disapprovingly that, "Hartshorne's theology is irretrievably anthropomorphic,"[16] Ogden can write with apparently little concern that Hartshorne's "working out [of] a frankly 'anthropomorphic' view of God must be admitted."[17] Whether anthropomorphism itself should count decisively against a proposed view of God is thus debatable, especially given the anthropomorphism of the biblical witnesses. The acceptability of any particular notion of God will be judged in the light of the Christian tradition and our contemporary understanding of the world, not simply upon its degree of anthropomorphism. We shall evaluate Hartshorne's God later; it is at that stage that his adequacy will have to be decided.

Although approaching the matter differently, Whitehead's reformed subjectivist principle leads to similar concerns. God, as real, is only to be discerned through the experience of subjects. This limits God's radical difference from creation. Of course, in practice, our positive concepts of God must always be so constrained; but Whitehead's principle makes that limit absolute. Whether this limitation is necessarily fatal to Whitehead's theology again cannot be immediately decided, particularly since the Christian tradition accepts that we ourselves reflect God's image to some degree. As with Hartshorne, the question can only be decided by evaluating the resultant theology.

Judgment must therefore be reserved whether the basic approach of process theology is flawed. However, we have already commented that traditional theism is not necessarily to be rejected because of its weaker points; the same likewise applies to process theology. If it is found that the tendency towards anthropomorphism is a severe weakness, this must be balanced by its strength which is its confluence with science. Whereas other approaches to divine action we have investigated have been reacting to science, either positively or negatively, none has redefined the metaphysical basis both

of theology and science in such a radical way as process theology. Thus Whitehead wrote,

> "Philosophy frees itself from the taint of ineffectiveness by its close relations with religion and with science, natural and sociological. It attains its chief importance by fusing the two, namely, religion and science, into one rational scheme of thought."[18]

Because this fusion is metaphysical, then if successful the empirical findings of science will remain unchallenged. Therefore, if a theology can be built upon the same metaphysical underpinning, there should be no friction with science. The strength of process theology is its framework for understanding God's relationship with the world; it is this which should be balanced against any weakness found in its doctrine of God.

We have noted a difference of approach between Whitehead and Hartshorne and we shall now proceed to investigate separately the two strands of process theology which stem from them. However, although there are real differences between them, it is easy to exaggerate their importance. In particular, it should be noted that Hartshorne takes much of Whitehead's thought as read. Thus, to some extent their separate treatment is no more than a convenience for drawing out different aspects of process thought.

(c) God as sympathetic participant in the world

Through the nineteenth century, the criticisms of theology engendered by the Enlightenment had given rise to liberal theology's concern with "the Fatherhood of God and the brotherhood of man". This resulted in a greater emphasis upon a notion of God as love which, combined with a scepticism about traditional metaphysics, was also corrosive of belief in the impassibility of God. Love was understood to require a mutual relationship. Hartshorne was one of those concerned to create a theological system which enshrined an essential relatedness of God to the world, without compromising some sense of God's absolute unsurpassability.

The theological system Hartshorne proposes[19] conceives God as being absolutely unsurpassable in his relatedness, whereby God is thus the supreme experiencer of reality. If we take it that a proper

understanding of relatedness should involve mutuality, then this implies that God must also be relative to his creation. Now, relativity and absoluteness are usually taken to be opposites, and so describing God as absolutely relative may seem to have the character of an oxymoron. This would be so were the two polar opposites to apply to the same concrete aspect of God. In fact, in the dipolar theism Hartshorne proposes, each polar pair is formed from a concrete and a corresponding abstract aspect of God. Thus, the relativity of God is concrete, in that he is related to every aspect of the universe. However, the absoluteness of his relativity is abstract: it is an implication of his being fully related to every aspect of the universe that no entity could have a greater relatedness.

One may ponder why these categories could not be reversed, so that the concrete aspect of God would be his absoluteness. The answer follows directly from the decision to place "becoming" before "being" in the process metaphysics: nothing absolute can be concrete, since an absolute is static and therefore has no actual existence. Much of the remainder of Hartshorne's system is simply the outworking of this decision, combined with his "Law of Polarity". This states that, when thinking of God metaphysically, we should always take account of both aspects of a polar pair. This is in contrast with classical theism which exalted one of each pair to an eminent degree and neglected the other. The prime example of its alleged weakness, as we have seen, is that if God is supremely absolute, he then loses all relativity.

One application of this law of polarity is in considering God's necessary and contingent existence. Hartshorne writes:

> "Existence is defined as the essence being *somehow* actualized; actuality is defined as *how*, or in *what* divine states or qualities, the essence is actualized. *Actuality* (except in the sense of being *somehow* actualized) *is always contingent*, even in the divine form."[20]

The concrete pole of God's existence is therefore contingent, as we may have expected since his existence is supremely related to the contingent world; the necessity of his existence is abstract, consisting in the fact that he must be related to the world.

Another polar pair we may apply to God is caused and uncaused. For Hartshorne, a perception is the effect of a cause out-

side oneself. Thus God, as omniscient of a contingent world, is supremely caused in his concrete pole; it is only in his abstract pole that he is uncaused.

In similar fashion, we can apply many other polar opposites to God: he is temporal by being concretely related to every time of the world's history, but he is abstractly atemporal by being related equally to every time; God is abstractly infinite because he is involved concretely in all the world's finitude; and so on. We may note that, in each case, the abstract pole of God's nature is always subordinate to his concrete pole. Thus, for instance, whilst God in his concrete pole is mutable, the abstract pole only enters through his being immutably mutable.

Is such an understanding of God adequate? Colin Gunton, in his study of Hartshorne's theology, finds two grounds for rejecting it: the impossibility of God truly acting as a cause, and the understanding of love which the theology in practice implies. Let us consider these criticisms in turn.

We have seen that, in his concrete pole, God is caused, and therefore an effect. Thus if God is to be a cause, he will be so in his abstract nature: but Gunton justifiably complains, "it is difficult to see how a cause can be abstract, in any recognizable meaning of the term."[21] Hartshorne nevertheless finds two senses in which God is a cause. First, he maintains that God acts as a final cause: the fact that we know God to be supremely an effect itself gives meaning and direction to the universe. Secondly, Hartshorne finds that God is also an efficient cause, although he here defines a cause as,

> "where previously there was only the potentiality of a certain value, there is now the actuality of this value."[22]

As Gunton points out, this is a strange definition since, for instance, "the bullet caused the glass to shatter" surely is not equivalent to, "the glass once shatterable, is now shattered."[23] But it does clarify how Hartshorne envisages God to act as a cause, because the definition is backwards looking in time: what is actual now (i.e. after the cause has acted) was previously only potential. Thus, as efficient cause, God is past: he acts through being externally related to events which are in his future, providing a store of concrete experience to which the future responds.

One could develop further the perplexities which result from this passive and abstract view of God's nature as a cause. However, that is not necessary, since it has become sufficiently apparent that Hartshorne's notion of God is very different from that traditionally conceived. In short, he has no requirement as such for a God who acts, as the following quotations makes clear:

> "It follows from the concept of the divine essence that the divine experience sums up with unique adequacy all the value of the entire natural world, and hence each thing can look to it for guidance and inspiration."[24]
>
> "Serving God should be its own reward, whether or not our last experience before our death is our last experience altogether. I find life its own reward, provided I can believe that all that is beautiful or good in my earthly living, and in that of those I can influence or help, will be cherished forevermore in the life of God."[25]

God, it seems, gives value and meaning to the world by acting as a guarantor of its final significance in the formation of his own experience, rather than by acting in any direct sense to fulfil his purposes within creation.

This concept finds expression in Hartshorne's favoured term, 'panentheism'. This means that, as in pantheism, all that is the world is also God; but the world does not constitute God without remainder. What seems to be additional, as Hartshorne writes, is that,

> "God is the individual with strictly universal functions, and the only such individual."[26]

It is God's abstract pole which prevents panentheism becoming pantheism; this seems to be the explanation for Hartshorne's fondness of the analogy of the world as God's body. To understand this, let us consider a pair of identical twins, John and Mark: any cell from John's body is concretely much the same as an equivalent cell from Mark's body, including its chromosomes. What differentiates these two cells is abstract, namely the universal properties of the bodies to which they belong, which makes one John and the other Mark. Likewise, God is the universal property of our world, not concretely present in any of its elements and therefore more than their sum, just as John is more than the sum of his cells.

Some authors, for instance Grace Jantzen[27], develop this analogy further. However, it founders when it is taken to be an attempt to understand God's direct agency in the world. It seems

unlikely that there is the organic unity in the universe to form a unified agent; and if one assumes the universe as a whole to be an agent, the relationship with the individual agents we see around us becomes problematical if their freedom is not to be compromised. Hence Thomas Tracy can rightly question:

> "Is the action of the super-individual simply the accumulated effect of the actions of many sub-individuals? If so, is the super-individual an agent in any significant sense? Does the super-individual act by somehow influencing the actions of the many sub-individuals? If so, is the super-individual surreptitiously being treated as a distinct entity that acts upon the society of many sub-individuals?"[28]

But it may be that these questions arise from using Hartshorne's analogy in a way different to his intention. The world as God's body uses the picture of a physical body as transcendently inhabited by spirit, rather than that of a spiritual agent embodied. Agency itself is something of a red herring.

Thus when Gunton criticizes the abstract nature of God's activity as a flaw, he seems to miss Hartshorne's point. However alien it may appear, this abstract causation forms a consistent part of Hartshorne's system. We can understand this from a slightly different stand-point from its development by Ogden in existential terms. He writes:

> "[God's] creative action as such is not an action *in* history, but an action that *transcends* it - just as, by analogy, our own inner decisions as selves are not simply identical with any of our outer acts of word and deed, but rather transcend or lie behind them as the decisions in which our words and deeds are grounded and to which they give expression."[29]

Following Heidegger, Ogden argues that the prime focus of a person's action is not the carrying out of a particular project, but the action by which the self as such is constituted. It is the radical decision truly to exist. Ogden continues:

> "Now, if God's action is to be understood by strict analogy to the action of man, what is meant by man's action is, first of all, this inner act whereby the human self as such is constituted, and constituted, moreover, as a self who loves. According to the central claim of the Christian witness of faith, the being of God is a being of 'pure unbounded love' (Charles Wesley). I take this to imply that the primary meaning of God's action is the act whereby, in each new present, he constitutes himself as God by participating fully and completely in the world of

his creatures, thereby laying the ground for the next stage of the creative process."[30]

The self-constitution of God does not need active agency as we might have understood that term. But it is now Gunton's second criticism of Hartshorne which will have more weight in terms of the intention of the theology. It concerns God's character as love, which motivated much of the criticism of tradition theism and lies at the heart of Hartshorne's conception: God as love demands relatedness. However, the reverse of this proposition is fallacious: relatedness *per se* is surely not love. Whilst Hartshorne has certainly created a God who is fully related to the world, the conclusion that such a God therefore loves the world remains vulnerable. As Gunton writes:

> "Merely because God is so constituted that everything that happens must make an impact upon him - a kind of metaphysical sponge, infinitely absorbent - are we to say that he *loves* everything?... The difficulty with the neoclassical suffering, for all its merits as a pointer to the real concern of God for his creatures, is that it is not also a doing. It is totally automatic and involuntary."[31]

If the movement from God's relatedness to his love is invalid, then it is not clear that Hartshorne can claim his God gives meaning and value to the world's existence in any sense. He is part of the world's reality, perhaps its cosmic memory, but not obviously someone who "cherishes" our existence. The belief that God participates in the world with sympathy remains undemonstrated.

We are now in a position to evaluate Hartshorne's doctrine of God, which has a number of strengths. First, of course, it enables God's relationship with his creation to be consistently conceived. This is reinforced by God's dipolar nature which allows him also to remain meaningfully absolute. A further positive point is the metaphysical analysis which allows God to be conceived as the ground of our confidence in existence in a manner plausible in our secular age.

Yet there remain two major difficulties with this doctrine of God. First, the success in conceiving of a God who is truly loving seems to have been undermined by the necessarily attenuated notion of love used. Love is itself an abstract term and not one readily defined, which is perhaps why Hartshorne's theology apparently stumbles over it. Whilst in the human context, love may entail involvement and empathy, it cannot be reduced to those terms. Miss-

ing is any sense of active desire, or active concern. A God who is supremely involved in creation is not thereby recognised as a God who supremely loves.

The second difficulty depends more upon a theological judgment. We have seen that Hartshorne's God gives value to the world by his presence rather than by his action. He is a final and an efficient cause solely because knowledge of his existence is held to influence the actions of his creatures. Now this is clearly a very different God to that conceived by the whole of Christian tradition, and perhaps should be rejected simply on that account. Talk of resurrection would seem to become meaningless and anthropology would become thoroughly Pelagian. However, combined with a Bultmannian existentialism, as Ogden proposes, much of Christian doctrine might be reinterpreted with some degree of consonance to traditional teaching.

But what counts against Hartshorne's system from the point of view of our current investigation is that it banishes any but the most Pickwickian sense of God's action in the world. To accept such theology would be to accept that no divine action is possible, in any commonly understood meaning of the term. The irony is that Hartshorne's God ends up being the passive observer of the universe, as much as the God of traditional theism was the impassible observer.

(d) God as creative persuasion

Having discerned problems with Hartshorne's theology, we turn to the strand of thought originating directly with Whitehead. It must be stressed again that in many ways it is artificial to separate Whitehead from Hartshorne, since they share so much in common. Also, Hartshorne builds upon Whitehead rather than vice versa. Yet their approaches are sufficiently distinct to make the separation of value.

Whitehead is often more difficult to fathom than Hartshorne and this is not always helped by the clarity of his terminology. For instance, in *Religion in the Making*, Whitehead tells us that "feeling" can be used as a synonym for "actuality"[32]. Yet he writes in *Process and Reality*:

> "[As primordial, God's] feelings are only conceptual and so lack the fulness of actuality."[33]

Or we may compare:

> "God *is* an actual entity"[34]

with:

> "Thus, *analogously* to all actual entities, the nature of God is dipolar."[35]

This is not to carp, but to warn that writers may with some justification interpret Whitehead in differing ways. As David Pailin writes:

> "[Whitehead's] ideas... have at times the provocative fruitfulness of concepts with fuzzy edges rather than the precision of components of a fully finished system."[36]

Let us now expound that system. Beyond both God and creation, Whitehead places at the centre of his self-styled philosophy of organism the concept of creativity, that which allows becoming:

> "In all philosophic theory there is an ultimate which is actual in virtue of its accidents. It is only then capable of characterization through its accidental embodiments, and apart from these accidents is devoid of actuality. In the philosophy of organism this ultimate is termed 'creativity'; and God is its primordial, non-temporal accident."[37]

John Cobb suggests that we should think of creativity as analogous to prime matter in Aristotle's physics, i.e. that which only exists in definite entities but which constitutes their matter[38]. He suggests we may name it equivalently energy-as-such, or activity-as-such; whatever, it is the point in the system where being is replaced by becoming.

Two points follow from this which are worth noting. First, whereas Hartshorne's dipolar God is concretely temporal, Whitehead maintains that God is non-temporal. Secondly, although God is primordial and thus is given a unique standing, he is nevertheless not the creator of the process of which he is part. *Creatio ex nihilo* has no place in this philosophy, because God without a concrete universe could not be in a state of becoming; he would be static being, which has no reality. However, this does not undermine his status as in some sense the creator of the universe, as we shall now see.

Whitehead variously develops his ideas from different points on the circumference of the closed system of his thought. In *Religion in the Making* he chooses to analyse the actual, temporal universe into three formative elements[39]. First amongst these is the absolute, creativity; there is "the realm of ideal entities, or forms" which are

not actual themselves, but are exemplified in everything that is actual; finally, there is,

> "the actual but non-temporal entity whereby the indetermination of mere creativity is transmuted into a determinate freedom. This non-temporal actual entity is what men call God."[40]

In this description we can see how God may be understood as creator. The underlying idea seems to be that pure creativity is utterly chaotic, a constant riot of opposing possibilities which stymie one another. God is that entity which, at every point, imposes an order on creation by making concrete one outcome in the process:

> "The definite determination which imposes ordered balance on the world requires an actual entity imposing its own unchanged consistency of character on every phase."[41]

The elementary events of this process are known as the actual occasions, which are the transitory individual creatures. Each actual occasion brings together a knowledge (or "prehension") of all the previous actual occasions in varying degree, the ideal forms, and God; it forges these by "concrescence" into a new actuality and thereby itself is now prehended by following actual occasions. When we experience the world, we do not observe the actual occasions directly, but rather "enduring individuals". These are societies of actual occasions whose prehensions of each another are dominant. They therefore take on characteristics that endure through a temporal progression. Thus, for instance, an electron, rock or person is each an enduring individual, with increasingly complex structures of prehension.

Whitehead points out that the system he has constructed is at this point deterministic. It is the presence of evil in the world which demands its further development, in particular two of its properties. First,

> "the common character of all evil is that its realization in fact involves that there is some concurrent realization of a purpose towards elimination. The purpose is to secure the avoidance of evil. The fact of the instability of evil is the moral order in the world."[42]

Since God is non-temporal and consistent, then this instability cannot find its origin in him. Secondly, evil is conceived to be ultimately aesthetic, so that it is a measure of value. The example is used of a man who has been degraded to the level of a hog: so far as the man

himself is concerned, he becomes no more evil than is a hog, not as such an evil creature. The evil lies in the comparison of what the man has become with what he could have been[43].

Combining these conceptions, God is the actual entity whose purpose is to give the world value by the elimination of evil. However, the actual occasions themselves have a degree of freedom sufficient to thwart God's intention. This is expressed by each actual occasion having a dipolar nature, mental and physical. Whilst the physical pole acts to prehend the other actual occasions and God's purpose for that occasion,

> "the mental pole introduces the subject as a determinant of its own concrescence."[44]

This mental pole is negligible in all non-living individuals. Thus, only in the higher creatures is there opportunity for God's intentions to be overridden, so that the "initial aim" provided by God does not become the "subjective aim" of the actual occasion.

As has an actual occasion, God has a dipolar nature (although not equivalent to that envisaged by Hartshorne): his primordial nature corresponds to the mental pole, whilst his consequent nature corresponds to the physical. It is his primordial nature which contains all the wealth of possibilities for the actual world; whereas,

> "the consequent nature of God is conscious; and it is the realization of the actual world in the unity of his nature, and through the transformation of his wisdom."[45]

Now we noted above that Whitehead understands God to be the chief exemplification of metaphysical principles, rather than an exception. The reason for this may be traced to the critique of traditional theism, where the metaphysical distinctness of the divine and created realities leads to unresolved tensions. Nevertheless, God and the actual world have something of a mirror-image relationship to one another in Whitehead's thought:

> "Neither God, nor the World, reaches static completion. Both are in the grip of the ultimate metaphysical ground, the creative advance into novelty. Either of them, God and the World, is the instrument of novelty for the other.
> "In every respect God and the World move conversely to each other in respect to their process. God is primordially one, namely, He is the primordial unity of relevance of the many potential forms: in the process He acquires a consequent multiplicity, which the primordial character absorbs into its own unity. The World is primordially many, namely, the many actual occasions with their physi-

> cal finitude; in the process it acquires a consequent unity, which is a novel occasion and is absorbed into the multiplicity of the primordial character."[46]

John Cobb believes that Whitehead's treatment of God's primordial and consequent nature is a weak point of his formulation[47]. He suggests that often Whitehead gives little reason for affirming God's consequent nature, other than to complete the analogy with the physical pole of other actual entities. The real interest, Cobb writes, is in God's primordial nature acting as the principle of limitation upon creativity; this then tempts Whitehead unduly to separate the two natures and assign different functions to each, whereas any actual entity is an inseparable synthesis of the two. The underlying function of the consequent nature, according to Cobb's reading, is to enable God to take proper account of the world when presenting the ideally-suited initial aim to each actual occasion.

However, Cobb here appears to miss a further factor in God's consequent nature which Whitehead emphasises:

> "In it there is no loss, no obstruction. The world is felt in a unison of immediacy...
> "The consequent nature of God is his judgment on the world. He saves the world as it passes into the immediacy of his own life. It is the judgment of a tenderness which loses nothing that can be saved."[48]

It is this notion of the immediacy of the world's life preserved in God which appears to play a major part in Whitehead's religious motivation. Let us now complete our survey of Whitehead by considering a little further this religious conception.

Whitehead is haunted by the fleetingness implied by a world of constant process; indeed, he acknowledges that the desire for permanence exhibited by Greek metaphysics is not to be denigrated[49]. As we pass through our temporal existence, we experience a "perpetual perishing" whereby the immediate present is lost to us, which Whitehead refers to as the "ultimate evil"[50]. The consequent nature of God is therefore important in Whitehead's notion of "objective immortality". Just as, to some degree, every actual occasion prehends all its predecessors, so God in his consequent nature perfectly prehends every actual occasion which then enters into God's life and becomes "a living, ever-present fact."[51] The reciprocal nature of divine and creaturely existence then means that this actuality in God

passes back into the world. Whitehead summarises his whole conception into four phases of the actualization of the universe:

> "There is first the phase of conceptual origination, deficient in actuality... Secondly, there is the temporal phase of physical origination, with its multiplicity of actualities... Thirdly, there is the phase of perfected actuality, in which the many are one everlastingly... In everlastingness, immediacy is reconciled with objective immortality... In the fourth phase, the creative action completes itself. For the perfected actuality passes back into the temporal world, and qualifies this world so that each temporal actuality includes it as an immediate fact of relevant experience. For the kingdom of heaven is with us today. The action of the fourth phase is the love of God for the world. It is the particular providence for particular occasions... the love in the world passes into the love in heaven, and floods back again into the world. In this sense, God is the great companion - the fellow-sufferer who understands."[52]

Elsewhere, Whitehead writes, "God is not the world, but the valuation of the world."[53] Thus the picture presented seems to be of God as that entity who so orders creativity that a world may be actualized. This is not a deterministic world and so it has a value attached to it which is contingent. God is also the measure of this value and presents the world with the opportunity to increase its value, through God's nature as love. It is also God who secures this value by its concretion in his own consequent nature.

Such is the outline of Whitehead's proposals. Are they helpful in our quest for a conception of God's action in the world which is plausible in our modern age? In their evaluation, three questions present themselves. Can God truly be said to act in this system? Is the conception of God's action consistent with our understanding of the world? And is the conception of God properly Christian?

Considering the first of these three of questions, we recall that a weakness of Hartshorne's development of process thought is his abstract notion of God as final and efficient cause. Thus he acts merely by being recognised in his metaphysical function as having the character of love. If we go with the grain of the world, so to say, then we should love too; but God seems to act as a cause in the absence of any specific intentions. The origin of this abstract nature of cause was in the dipolar construction of the theology. This, however, is not a feature of Whitehead's thought: the primordial and

consequent natures of God enter the description in a different way. God is involved as an actual entity in the concretion of an actual occasion, and therefore he is not purely abstract in his action. We have noted that the mental pole of the occasion can disregard this action and select a different subjective aim; but that is not to invalidate our counting God's input as an action. God has an intention for each occasion in his presentation of its initial aim, and surely intention is of the essence of action.

We consider next, therefore, whether we can accept this notion of divine action in the light of modern science. Here the question arises of process theology's acceptance of panpsychism. Pailin suggests that a process view does not of itself require such an attachment[54] (indeed, Ogden does not accept it, for instance), but it is apparently needed in Whitehead's system to allow the atomic actual occasions a degree of autonomy from God's *diktat*. However, panpsychism need not be a major problem from the point of view of science. We have already noted that it is only higher entities in which the mental pole becomes active: in other words, it is those entities with a complex structure. But, as we have seen in chapter five, the idea that mind may be an emergent property of an increasingly complex system is not itself foreign to science. If panpsychism is a metaphysical proposal, however much it might seem against common sense, it is probably safe from scientific attack.

It must be admitted that the whole conception of actual occasions can seem impenetrably mysterious, including their prehension of one another. Again, however, modern science's view of the world is not inimical to such a metaphysic. The subatomic nature of reality is felt to be mysterious by working physicists and paradoxes of quantum mechanical action at a distance, for example, are the subject of contemporary research.

Thus we find no fatal flaw in Whitehead's conception of the manner of God's interaction with the world. It allows for the freedom and self-determination of the world we experience, whilst giving a consistent means of God's influence within it.

So we come to the final question: is Whitehead's theology a sufficient representation of Christianity? As with Hartshorne, its qualification is defended with an appeal to love. Thus, Whitehead

writes of the "Galilean origin" of the Christian tradition which,

> "dwells upon the tender elements in the world, which slowly and in quietness operate by love; and it finds purpose in the present immediacy of a kingdom not of this world. Love neither rules, nor is it unmoved; also it is a little oblivious as to morals. It does not look to the future; for it finds its own reward in the immediate present."[55]

In Hartshorne's theology, God's love seemed to be reduced to the conviction that God is fully related to the world. Whitehead, however, seems to allow love a more active role in influencing the course of the world's development through God's provision of initial aims, and it is through love that the world finds its value. God's action is the evocation of a response from his creatures, through the lure of love incarnate within them. This is recognizably Christian.

Yet Christianity is more than the belief that God is love. In its traditional forms, God does more than look on from the sidelines and encourages us in his purposes. He acts decisively to save us from ourselves; his purposes cannot ultimately be defeated. As Ian Barbour writes in an otherwise positive assessment of process theology,

> "one wonders whether Whitehead's God is *too powerless* to inspire worship. Perhaps in addition to the "persuasive" aspects of God there are more active and authoritative aspects, to which the sense of inescapable judgment and overwhelming awe in religious experience testify."[56]

We may feel that, as with any systematization, too much of the religious tradition is omitted from this theology. It is beyond the scope of this work to decide that question. Positively, however, what we have found in process theology is a technique which successfully overcomes many of the problems of relating a transcendent God to his creation. If conceiving of God's action in the world is taken to be a core problem of modern theology, then this success should motivate further investigation into process theology's possible consonance with a wider Christian tradition.

Chapter 8: Conclusion

The objective of our investigation has been to find a model, or class of models, of divine interaction with creation which does not violate our scientific understanding of the world. The scientific understanding in question, we argued in chapter three, should be critically realist. That is, on the one hand, the world exists whether or not it is being observed and therefore is more than the sum of human experience of it. The physical laws revealed by science are taken to relate meaningfully to that world, so that theoretical terms such as "electron" have a counterpart in reality. But on the other hand, our knowledge is not perfect and is always open to correction. As in any human endeavour, our beliefs are founded upon the full spectrum of experience and rational enquiry, and they are never beyond doubt. Thus we can never simply identify the reality we observe with our present scientific theory. Nevertheless, this understanding of science requires that any proposed mode of God's interaction with the physical universe should be consonant with it, or otherwise that it should be explicitly recognized that the interaction involves a violation of the natural order.

In fact, no modern theologian with whom we have dealt has proposed that God's action should in every case be understood to involve an explicit violation of physical law (even should miracles be countenanced on occasion). That surely reveals a sound instinct. For Christianity has generally taken a high view of the doctrine of creation. Creation is that which in a measure stands apart from God and which God himself has seen to be very good (Genesis 1:1-2:4). If, in order to interact with it, God must in some way undermine those very laws with which he has chosen to order creation, then this would seem to place under question the perfection of God's creative. To put the matter simply, is it worthy of an omnipotent and wise God to create a universe whose laws he himself must violate in every one of his actions? The problems are compounded if physical laws are not seen

as a type of external constraint upon the behaviour of matter, but part of matter's essence. For example, we might identify exclusively the essence of an electron as being behaviour in accordance with certain physical laws. In that case, for God to intervene to suspend those laws would entail the destruction of creation itself.

Having discounted such a model of divine action, we are left with four other types of solution to the problem of God's action. Let us term these the types of independence, determinism, scientific openness and modified metaphysics.

The type of independence includes those models of divine action which affirm both that science is valid and complete in its appropriate sphere and also that science is of no direct relevance to the conceptualization of God's interaction. Examples of such models which we have examined are secondary causation (although we argued that this assumes compatibilism; it therefore might more properly belong to the type of determinism); Farrer's double agency; Bultmann's existentialist account; and Wiles' understanding of the creation as being a single act of God. However, we found that none of these models was satisfactory.

In the case of double agency, the analogy of action used was too stretched to be anything more than a restatement in different terms of the problem of how God could make use of the worldly web of causation to enact his own purposes. Farrer himself, as we saw, was content that the "causal joint" between the creator and the creation should remain obscure. To the extent that our experience of God's action will for ever be beyond our powers of full explanation, this contentment might be laudable. But it does not advance a solution to the problem with which deism, liberalism and the present age of theology have grappled. It is a proposal that the problem is insoluble.

The models of divine action forwarded by Bultmann and Wiles derive from different presumptions. Bultmann is part of that tradition which seeks the validation of religion not through the truths of history, but the grace of inward faith. Wiles is more concerned with questions of God's justice and the problem of evil in the world around us. Nevertheless, from their differing starting points, both have God operating in a mentalistic sphere putatively independent of the world

of science. Each encounters the same problem, for the basic form of divine action is then an interaction between God and the human consciousness, although this is more clear with Bultmann than with Wiles. Ultimately, therefore, both models depend for their coherence on the validity of human consciousness being divorced from the constraints of physical causation, if their independence from scientific claims is to be maintained. Now it may prove to be the case that human consciousness is indeed independent of the physical structure of the brain, but this would be a scientific question. Any notion that such a model is independent of science in all circumstances is therefore invalidated. An alternative would be to maintain a Cartesian dualism, but neither Bultmann nor Wiles claims such.

There is thus no successful example of a model of divine action which is entirely careless of scientific findings. Furthermore, it would seem unlikely that such a model could exist, for we are altogether too enmeshed in the causal nexus around us. However, this type of model shades into the type of determinism in which all that occurs in creation is by the direct warrant of God. This could be in accord with physical law: clearly there is no disagreement with those processes which are deterministic; in those processes of a probabilistic nature, God would be an unseen hand. From the question we have set ourselves in this thesis, theological determinism must seem to count as a model of divine action which does not violate physical law.

Yet a number of issues combine to lessen determinism's attractiveness, as discussed in chapter four. Foremost, of course, is the acceptability of theological determinism in the first place. This is a subject we have placed beyond the scope of this thesis, but it has clear implications for human responsibility and God's responsibility for evil actions in the world. As we noted, Paul Helm, who makes a strong defence of theological determinism, accepts that there are real weaknesses in this area. However, these are not sufficient for us completely to reject the possibility of theological determinism.

Nevertheless, there is cause to reject theological determinism when combined with a mechanically deterministic view of creation. In this case, problems relate to revelation in particular. Calvin perceived the need in his deterministic system for revelations of God's intention to be marked in some unspecified way, so that their genuineness could

be assured. If the world were mechanically deterministic, such marks could not be produced, since anything which happened could be deduced from natural causes alone. The only other possibility would be for some miracle to occur. But now, not only would mechanical determinism have been violated (calling into question the perfection of God's own creation), but problems of verifying miracles would arise. Although such a view of affairs is not impossible to countenance, it is at the least inelegant to imagine God's interaction with his creation happening solely through the device of miracle.

It would seem that theological determinism is best combined with a view of science that is not itself strictly deterministic. As we have seen, this itself accords well enough with a modern scientific outlook, although it is by no means proved that science has indeterministic elements. Thus, for instance, quantum theory has both deterministic and indeterministic elements combined in a rather *ad hoc* and unsatisfactory manner. It is fair to say that any resolution of the theory's problems is expected to retain the indeterministic element, but strictly speaking this remains an open question. Be that as it may, the combination of theological determinism and scientific indeterminism itself gives rise to problems. Neglecting the ever-present question of human responsibility, this view would commit us to the belief that the probabilistic outcomes of events which science properly predicts are in fact determined from eternity by God. But would there not here be an element of deception on the part of God? The probabilistic laws which the scientist rightly observes to delineate indeterministic phenomena would in reality be illusory. It seems that the God of truth would have misled us.

Deterministic models of God's action thus have various difficulties with which to deal. Nevertheless, it may be that none of these is insuperable. And, interestingly, we observed that this type of model allows God to be timelessly eternal; we suggested that timeless eternity may itself be congenial to modern physics.

The third type of model of divine action we have termed that of scientific openness. The type is characterized by a rejection of determinism, but a conviction that the world described by science is now complex and open enough to allow us to begin to conceive God's direct interaction with it. These models were investigated in chapters

five and six in their two major aspects.

First, much is made of anti-reductionism. There is an increasing recognition that the language and concepts appropriate, say, to fundamental particle physics cannot be assumed to be appropriate for systems composed of those particles. The behaviour of a herd of cattle is not to be understood merely in the same way as the behaviour of the particles out of which they are composed. It is suggested that the same may be particularly true of the relationship of mind and brain. Thus one may propose that God does not interact with the lowest levels of creation (whose interactions are limited by the simplicities of physical law), but can be conceived to interact with the higher levels.

Unfortunately, this hope cannot be realized. Anti-reductionism, we argued, is motivated by a rejection of dualism. Thus it is unwise to suppose that a dualistic interaction with God can be introduced via its use. Rather, anti-reductionism is making claims about the manner in which a complex system is to be described, although still founded upon a physical base in the most common understanding. Because such a system might not be comprehended by simple physical laws, it does not follow that ontologically it is open to non-physical interactions. There is but one reality and that reality remains physical, however different from lower-level systems it might appear.

The second aspect of these models of divine action is their appeal to the new vistas of science opened in recent years. Instead of an inert view of matter, capable only of being moulded by external forces, the view is gaining ground which understands matter to be energetic and fruitful, always exploring new possibilities without being constrained deterministically. No longer, it is claimed, need there be any barrier placed between animate and inanimate matter, for the one becomes the other quite naturally. And if the creation is so friendly to life and consciousness, then perhaps it is open to God's interaction. In the work especially of Arthur Peacocke and John Polkinghorne we examined some of the proposed ways in which this might be so.

Yet we concluded that this approach will fail. It is stymied by a fundamental contradiction between the desire to allow science to be fully autonomous and self-sufficient, whilst attempting to include

an interaction with a reality beyond the created universe. Some "causal joint" is required between the two realities, but science cannot know of any such joint without *ipso facto* including it within science's province. God could only interact with creation in such a way by himself becoming a cause alongside other regular causes and so part of the physical universe; he would also become a cause in principle capable of scientific investigation, which would hardly be welcome. God cannot interact with his creation in a way describable by science.

The final type of model of divine interaction we have termed that of modified metaphysics. The other types each left the understanding of science untouched, assuming it to be a given in understanding divine action. In this final case, however, some modification of science is envisaged, but not such as to allow any alteration of the results of scientific research. Rather, the underlying metaphysics are altered and it is at that level that God's activity is then introduced. The example of this approach we have examined is process theology, in which we found both an advantage and a disadvantage.

Positively, process theology appears to give us a coherent framework which incorporates both the autonomy of science and the immanent activity of God. The divine action is constituted largely by an inner final cause in creation, urging an advance towards the values realized by love. Such a final cause is not detectable by science, because it is effective within events rather than upon events. Further, it is only nascent within the lower levels of creation such as electrons and rocks. Thus these entities fully obey physical laws. It is only when levels of consciousness are reached that the lure of divine love becomes effective. But at the level of consciousness, the appropriate science is psychology and sociology and there is nothing contradictory in supposing that these sciences may in principle detect a bias in human society towards something we might describe as love.

Negatively, however, the God of process theology and that of traditional Christianity are clearly not identical. Process theology understands God to become real only through the process of creation (which he himself did not create); neither is God omnipotent. Notions of God's mighty arm, of his power to save and his glorious majesty find no home in this theology. In fact, the charge that process

theology's God is a weakling might not be without substance. Perhaps attempts to modify our metaphysics, under the constraint that science should be preserved, will always result in a weakened understanding of God.

With what, then, are we left? Of the four types of models of divine action, we argued that two were unsustainable: the types of independence and scientific openness. God's action cannot be understood in complete independence from science; attempts to incorporate a transcendent God's activity in his creation in scientific terms will also fail. The two remaining options are some version of determinism and some version of process theology.

Each of these two types of model have their weaknesses, as we have seen. Determinism tends to diminish human responsibility and may also render the whole of scientific enquiry a charade. Process theology etiolates Christianity into something seemingly less than full blooded. In terms of maintaining a strong view of science, which may be what is demanded by our modern age, then process theology is more successful. In any case, its technique of modifying the underlying metaphysic appears to be fruitful. But, as we have previously emphasised, different theological models will each have their strengths and weaknesses. In their broader consideration, it is a matter of judgment which of these four types of model is preferable.

In the debate about science and religion, it is interesting that two of the most important foundational areas remain unclear. First, the limits of science are not known. Of course, this is likely to remain the case, but in particular brain science is only in its infancy. In trying to understand things of the spirit, we do not even yet agree whether it may be possible for science to comprehend consciousness. Secondly, in theology, the breadth of debate emphasises a lack of consensus on what is actually required of divine interaction. At present, the spectrum extends from deists content to know only that God cared enough to make his creation, to those whose religion sees God intimately ordering every aspect of their lives. In these circumstances, agreement will be hard to reach on the success of any one model of divine action in the light of science.

Nevertheless, theology has always involved the mutual reflection upon our experience of God and of the universe. The question of

models of divine action is part of that debate and surely it will also form part of its clarification in our modern age.

Notes

Chapter 1: Introduction

1. See chapter 2 for a fuller discussion of secondary causation.
2. Maurice Wiles, *God's Action in the World* (London: SCM Press, 1986) p.4.
3. This summary is indebted to the introduction in Owen C. Thomas (ed.), *God's Activity in the World* (Chico, California: Scholars Press, 1983).
4. Newton was in fact happy, for instance, to invoke divine action to preserve the solar system by means of small corrections delivered to the planets in their orbits. See, for instance, Edward B. Davis, "Newton's Rejection of the 'Newtonian World View': The Role of Divine Will in Newton's Natural Philosophy" in *Science and Christian Belief* 3 (1991) 103-117.
5. G. Ernest Wright, *God Who Acts: Biblical Theology as Recital* (London: SCM Press, 1952), extract reprinted in Thomas, op. cit., pp.17,26.
6. Frank B. Dilley, "Does the 'God Who Acts' Really Act?" in *The Anglican Theological Review* 47 (1965) 66-80 reprinted in Thomas, op. cit., p.45 (italics his).
7. Langdon B. Gilkey, "Cosmology, Ontology and the Travail of Biblical Language" in *The Journal of Religion* 41 (1961) 194-205, reprinted in Thomas, op. cit., p.31.
8. Rudolf Bultmann, "New Testament and Mythology: the Problem of Demythologizing the New Testament Proclamation" reprinted in *New Testament and Mythology and Other Basic Writings* (London: SCM Press 1985) pp.4,5.
9. As argued, for instance, by Wiles, op. cit.
10. See, for example, Anthony Freeman, *God in Us* (London: SCM Press, 1993) for a recent statement of a Christian Humanist's position.
11. John Polkinghorne, *Science and Creation* (London: SPCK, 1988) p.2, referring to Jurgen Moltmann, *God in Creation* (English translation: London: SCM Press, 1985).

Chapter 2: Modern Science and Divine Action as Independent Realities

1. See Etienne Gilson, *The Christian Philosophy of St Thomas Aquinas* (London: Victor Gollancz, 1957).

2. Translation by Anthony Kenny in his *The Five Ways* (London: Routledge & Kegan Paul, 1969) p.34.
3. Kenny, op. cit., pp.41-45.
4. Aquinas, *Summa Theologica* Ia,46,2 & 7, quoted in Kenny, p.41.
5. S.T. Ia,115,3.
6. S.T. Ia,22,2 (this and following quotations from Blackfriars edition, 1967).
7. S.T. Ia,22,3.
8. ibid.
9. S.T. Ia,23,3.
10. Austin Farrer, *Faith and Speculation* (London: A & C Black, 1967) p.159.
11. Farrer, op. cit., reprinted in Owen C. Thomas (ed.) *God's Activity in the World* (Chico, Califiornia: Scholars Press, 1983) p.199.
12. ibid., p.197.
13. Maurice Wiles, "Farrer's concept of double agency", *Theology* LXXXIV July 1981, 243-249.
14. Vernon White, *The Fall of a Sparrow* (Exeter: Paternoster Press, 1985) p.108.
15. See chapter 5.
16. Rudolf Bultmann, "New Testament and Mythology: The Problem of Demythologizing the New Testament Proclamation" (1941) reprinted in *New Testament and Mythology and other basic writings* (London: SCM Press, 1984) p.18.
17. See, for instance, Anthony C. Thiselton, *The Two Horizons* (Exeter: Paternoster Press, 1980).
18. Rudolf Bultmann, "On the Problem of Demythologizing" (1961) reprinted in Bultmann, op. cit., p.161.
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21. ibid., p.39.
22. Bultmann, "On the Problem of Demythologizing" (1952), op. cit., p.110.
23. Thomas, *God's Activity*, op. cit., p.7.
24. Bultmann, "On the Problem of Demythologizing" (1952), op. cit., p.114.
25. Thomas, *God's Activity*, op. cit., p.7.
26. Bultmann, ibid., p.111.
27. Bultmann, ibid., p.112.
28. Maurice Wiles, *God's Action in the World* (London: SCM Press, 1986) p.16.

29. Wiles, *God's Action*, op. cit., p.25.
30. ibid., p.49.
31. ibid., p.96.
32. ibid., pp.97 ff.
33. Wiles, "Religious Authority and Divine Action", *Religious Studies* 7 (1971) 1-12 reprinted in Thomas, op. cit., p.188.
34. Wiles, *God's Action*, op. cit., p.101.
35. ibid., p.102.
36. ibid., p.56.
37. Vernon White, op. cit., p.70.
38. Wiles, *God's Action*, op. cit., p.100.
39. ibid., p.103.
40. ibid., p.105.
41. Wiles rejects Bultmann's ideas: see *God's Action*, op. cit., pp.31 ff.

Chapter 3: The Interpretation of Modern Science

1. For a full discussion, see Anthony O'Hear, *An Introduction to the Philosophy of Science* (Oxford: Oxford University Press, 1989) pp.12 ff.
2. Nelson Goodman, from the lecture reprinted in *Problems and Projects* (Indianapolis: Bobbs-Merill, 1972).
3. See, for instance, his *Conjectures and Refutations* (London: Routledge & Kegan Paul, 1962).
4. See Richard Taylor, "Causation" in Paul Edwards (ed), *The Encyclopedia of Philosophy* (London: Macmillan, 1967) 56-66.
5. Bertrand Russell, "On the notion of cause" in *Mysticism and Logic* (London: Unwin Paperbacks, 1986), p.181.
6. See A.E. Taylor, *Elements of metaphysics* (London: Methuen, 1909), p.158ff.
7. Aristotle, *Metaphysics* D,2.
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9. op. cit., p.173.
10. David Hume, *An Enquiry concerning Human Understanding* (1777; 3rd ed. Oxford: Oxford University Press, 1975) IV, I, 21 (italics his).
11. ibid., VII, I, 50.

12. Hume, op. cit., VII, II, 60.

13. ibid.

14. Immanuel Kant, *Critique of Pure Reason* trans. Norman Kemp Smith (London: Macmillan, 1958).

15. Ernst Mach, *The Science of Mechanics* (1883; 6th English trans. La Salle, Illinois: Open Court Publishing Co, 1960) reproduced in Bakker and Clark, op. cit., pp.48,49.

16. Irving Copi, *Introduction to Logic* (London: Macmillan, 3rd ed. 1968) pp.400-406, reprinted in Bakker and Clark, op. cit., pp.59-63.

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24. Carl Hempel, *Aspects of Scientific Explanation and Other Essays in the Philosophy of Science* (Glencoe, Ilinois: Free Press, 1965).

25. Salmon, op. cit., p.106.

26. Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962).

27. Bas van Fraassen, *The Scientific Image* (Oxford: Oxford University Press, 1980), discussed in O'Hear, op. cit.

28. Salmon, op. cit., pp.124 ff.

29. Salmon, op. cit., gives a detailed survey.

Chapter 4: Physical Law and Theological Determinism

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3. David Hume, *Enquiry Concerning Human Understanding* (3rd ed. Oxford: Oxford University Press, 1975) VIII, I, 73 (italics his).

4. Daniel C. Dennett, Elbow Room (Oxford: Oxford University Press, 1984) p.77.
5. ibid., p.169.
6. Donald M. MacKay, *The Open Mind and other essays* (Leicester: Inter-Varisty Press, 1988) ch. 6.
7. MacKay, op. cit., pp.60,61 (italics his).
8. Richard Swinburne, *Responsibility and Atonement* (Oxford: Oxford University Press, 1989) p.59.
9. Inst. 1.17.5; 1.18.3.
10. Paul Helm, *Eternal God: a Study of God without Time* (Oxford: Oxford University Press, 1988) p.159.
11. Paul Helm, *The Providence of God* (Leicester: Inter-Varisty Press, 1993) p.34.
12. Inst. 1.16.3.
13. Inst. 1.6.1.
14. Inst. 1.7.4.
15. See Inst. 1.8.1.
16. Inst. 4.8.9.
17. Com.Isa. 1.1 This and other quotations not from the *Institutes* are cited in Edward J. Dowey, Jnr, *The Knowledge of God in Calvin's Theology* (New York: Columbia University Press, 1952) pp.94 ff.
18. Com.Gen. 37.5.
19. Com.Gen. 15.2.
20. Inst. 1.16.8.
21. cf. Inst. 3.2.14.
22. Inst. 3.23.7.
23. Donald M. MacKay, "The Sovereignty of God in the Natural World" in *Scottish Journal of Theology*, 21 (1968), pp.13-26 reprinted in Donald M. MacKay, *The Open Mind and Other Essays* (Leicester: Inter-Varsity Press, 1988) p.189.
24. Quoted in William Hasker, *God, Time and Knowledge* (Cornell University Press, 1989), p.178.
25. Boethius, *The Consolation of Philosophy* 5 quoted in Brian Davies, *Thinking about God* (London: Chapman, 1985) p.148.
26. Anthony Kenny, *The God of the Philosophers* (Oxford: Oxford University Press, 1979) p.38.
27. Helm, *Eternal God*, op. cit., p.113.

1. See J. Hick and M. Goulder, *Why Believe in God?* (London: SCM Press, 1983) p.83.
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7. Keith Campbell, *Body and Mind* (London: Macmillan, 1970).
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11. Campbell, op. cit., p.45.
12. As, for instance, Richard Swinburne, "The Structure of the Soul" in Arthur Peacocke and Grant Gillett (eds), *Persons and Personality* (Oxford: Basil Blackwell, 1987) pp.35-55.
13. Carl Hempel, *Philosophy of Science* cited in Anthony O'Hear, *An Introduction to the Philosophy of Science* (Oxford: Oxford University Press, 1989), p.189.
14. For further discussion of the problems of realism, see Charles and Lennon, op. cit., pp.11 ff and references therein.
15. Karl Popper, The Open Universe (London: Hutchinson, 1982) cited in O'Hear, op. cit., p.181.
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20. ibid., p.55 endnote.
21. ibid., p.2 endnote.

22. Dawkins, op. cit., p.60.
23. Charles and Lennon, op. cit., p.2 (italics theirs).
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26. See, for instance, J.J.C. Smart, *Philosophy and Scientific Realism* (London: Routledge & Kegan Paul, 1963).
27. See, for instance, D.M. Armstrong, *A Materialist Theory of Mind* (London: Routledge & Kegan Paul, 1968).
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30. John Searle, 'Minds brains and programs' in J. Haugeland (ed.) *Mind Design* (Cambridge, Mass. 1981) cited in Teichman, op. cit.
31. Donald Davidson, 'Mental Events' (1970) reprinted in *Essays on Actions and Events* (Oxford: Oxford University Press, 1980).
32. op. cit. p.214.

Chapter 6: Modern Science as an Opening for Divine Interaction

1. Jacques Monod, *Chance and Necessity* (Eng. trans. London: Collins, 1972).
2. ibid., p.154.
3. ibid., p.162 (italics his).
4. ibid., p.163 (italics his).
5. See for instance, A.R. Peacocke, *Intimations of Reality* (Notre Dame: University of Notre Dame Press, 1984).
6. David J. Bartholomew, *God of Chance* (London: SCM Press, 1984) p.91.
7. Monod., op. cit. p.96.
8. ibid., p.110 (italics his).
9. See Mary Midgley, *Science as Salvation* (London: Routledge & Kegan Paul, 1992), especially ch.11.
10. Donald M.MacKay, *Science, Chance and Providence* (Oxford: Oxford University Press, 1978) part II.
11. Bartholomew, op. cit. p.95.
12. Monod, op. cit., p.49 (italics his).
13. Ilya Prigogine and Isabelle Stengers, *Order out of Chaos* (first published 1979; Eng. trans. London: Heinemann, 1984) p.176.
14. Example cited in John Polkinghorne, *Science and Providence* (London: SPCK, 1989) p.28.

15. Prigogine and Stengers, op. cit., pp.146 ff.

16. ibid., p.xxix.

17. Monod, op. cit., p.158.

18. Steven Weinberg, *The First Three Minutes* (London: Andre Deutsch, 1977) p.149.

19. Fritjof Capra, *The Tao of Physics* (London: Wildwood House, 1975) p.9 (italics his).

20. This is one of the criticisms made by T.J. Axon, *Beyond the Tao of Physics* (Stockport: Tehuti Press, 1988) pp.59 ff.

21. Capra, op. cit., p.33.

22. There is a large literature on the subject. One non-technical assault on the philosophy of the Copenhagen Interpretation is contained in Stanley Jaki, *Chance or Reality and Other Essays* (Washington, DC: University Press of America, 1986).

23. See, for instance, David Bohm, *Wholeness and the Implicate Order* (London: Routledge & Kegan Paul, 1980).

24. See, for instance, Roger Penrose, *The Emperor's New Mind* (Oxford: Oxford University Press, 1989).

25. Capra, op. cit., p.318.

26. ibid., p.86.

27. ibid., pp.71,72.

28. ibid., p.25.

29. James Lovelock, *Gaia: a new look at life on Earth* (Oxford: Oxford University Press, 1979) extracted in Connie Barlow (ed.), *From Gaia to Selfish Gene* (Cambridge, Massachusetts: The MIT Press, 1991) p.18.

30. James Lovelock, *The Ages of Gaia: A biography of our living Earth* (Oxford: Oxford University Press, 1988) extracted in Barlow (ed.), op. cit., p.41.

31. For a review of some of the issues raised, see for instance Lawrence Osborn, "The Machine and the Mother Goddess: the Gaia Hypothesis in Contemporary Scientific and Religious Thought" in *Science and Christian Belief* 4(1) 1992, pp.27-41.

32. Lesslie Newbigin, *Foolishness to the Greeks* (London: SPCK, 1986) pp.39,40.

33. Polkinghorne, op. cit., p.4.

34. ibid.

35. ibid., p.6.

36. ibid., pp.27,28.

37. ibid., p.30.

38. ibid., pp.32,33.

39. John Polkinghorne, *Reason and Reality* (London: SPCK, 1991) p.42.

40. ibid., p.45.

41. For instance, John Barrow and Frank Tipler make much of information theory in their book, *The Anthropic Cosmological Principle* (Oxford: Oxford University Press, 1986).

42. William Pollard, *Chance and Providence* (London: Faber & Faber, 1959) cited in Bartholomew, op. cit., pp.125 ff.

43. Bartholomew, op. cit., pp.131,141.

44. See for instance Polkinghorne, *Science and Providence*, op. cit., p.83.

45. ibid., pp.31,32.

46. Especially against the criticisms made by Arthur Peacocke (see his book, *Theology for a Scientific Age* (Oxford: Basil Blackwell, Oxford, 1990) pp.153 ff), although, when reviewing that book, Polkinghorne claims Peacocke to have misunderstood him (see *Theology* May/June 1994, p.199).

47. Polkinghorne, *Reason and Reality*, op. cit., pp.39,41.

48. John Polkinghorne, *One World* (London: SPCK, 1986) p.79.

49. Peacocke, op. cit. pp.57 ff citing Donald Campbell, "'Downward causation' in hierarchically organised systems", in F.J. Ayala and T. Dobzhansky (eds.) *Studies in the Philosophy of Biology: Reduction and Related Problems* (London: Macmillan, 1974) pp.179-86.

50. Peacocke, op. cit., pp.60,61.

51. ibid., p.161.

52. ibid., p,164.

Chapter 7: Process Theology: A Radically Different Approach

1. Taken to be exemplified by such writers as Alfred North Whitehead, Charles Charles Hartshorne, John Cobb, David Ray Griffin and Schubert Ogden.

2. See, for instance, Colin E. Gunton, *Becoming and Being: the doctrine of God in Charles Hartshorne and Karl Barth* (Oxford: Oxford University Press, 1978) p.19. Gunton nevertheless rejects Hartshorne's proposed metaphysics.

3. This treatment follows Gunton, op. cit., pp.12-20.

4. Anselm, *Proslogium* (La Salle, Illinois: Open Court Publishing House, 1903,1945) p.13.

5. Thomas Aquinas, *Summa Theologica* 1a,13,7.

6. Schubert M. Ogden, *The Reality of God and other essays* (New York: Harper & Row, 1977) pp.17,18.

7. ibid., p.51.

8. John B. Cobb, Jnr, and David Ray Griffin, *Process Theology: an introductory exposition* (Belfast: Christian Journals Ltd, 1977) p.19.

9. Charles Hartshorne, "Metaphysical and Empirical Aspects of the Idea of God" in Philip E. Devenish and George L. Goodwin (eds), *Witness and Existence: Essays in Honour of Schubert Ogden* (Chicago: University of Chicago Press, 1989) p.177.
10. Alfred North Whitehead, *Process and Reality* (Cambridge: Cambridge University Press, 1929) pp.219ff.
11. Ibid., p.486.
12. Hartshorne, op. cit., p.179.
13. See, for example, Charles Hartshorne, *Anselm's Discovery: A Re-examination of the Ontological Proof for God's Existence* (La Salle, Illinois: Open Court Publishing, 1965).
14. Ogden, op. cit., p.21.
15. Ogden, however, acknowledges that, in his argument, he too readily equates the metaphysical God with the Christian God (ibid., pp.x,xi).
16. Gunton, op. cit., p.222.
17. Ogden, op. cit., p.175.
18. Whitehead, *Process and Reality*, op. cit., p.21.
19. This summary of Hartshorne's thought is based upon that found in Gunton, op. cit., ch.2.
20. Hartshorne, "Metaphysical and Empirical Aspects of the Idea of God", op. cit., p.183 (italics his).
21. Gunton, op. cit., p.39.
22. Charles Hartshorne and William L. Reese, *Philosophers Speak of God* (Chicago: University of Chicago, 1953) p.221 cited in Gunton, op. cit., p.37.
23. Gunton, op. cit., p.38.
24. Hartshorne, *Anselm's Discovery*, op. cit., p.293f, cited in Gunton, op. cit., p.43.
25. Hartshorne, "Metaphysical and Empirical Aspects of the Idea of God", op. cit., p.185.
26. ibid., p.182.
27. Grace Jantzen, *God's world, God's body* (London: Darton, Longman & Todd, 1984).
28. Thomas F. Tracy, *God, Action and Embodiment* (Grand Rapids: Eerdman, 1984) p.115.
29. Ogden, op,cit., p.179 (italics his).
30. ibid., p.177.
31. Gunton, op. cit., p.220 (italics his).
32. Alfred North Whitehead, *Religion in the Making* (Cambridge, Cambridge Univesity Press, 1930) p.91.

33. Whitehead, *Process*, op. cit., p.486.

34. ibid., p.24 (italics mine).

35. ibid., p.488 (italics mine).

36. David A. Pailin, "Process Theology" in Alan Richardson and John Bowden (eds), *A New Dictionary of Christian Theology* (London: SCM Press, 1983).

37. Whitehead, *Process*, op. cit., p.9.

38. John B. Cobb, Jnr, "Natural Causality and Divine Action" in *Idealistic Studies* 3 (1973) 207-222 reprinted in Owen C. Thomas (ed), *God's Activity in the World* (Chico, California: Scholars Press, 1983) p.104.

39. Whitehead, *Religion*, op. cit., pp.77f.

40. ibid., p.78.

41. ibid., pp.81,82.

42. ibid., p.82.

43. ibid., p.88.

44. Whitehead, Process, op. cit., p.351.

45. ibid., p.488.

46. ibid., pp.493,494.

47. John B. Cobb, Jnr, *A Christian Natural Theology* (Philadelphia: Westminster Press, 1965) pp.166,167.

48. Whitehead, *Process*, op. cit., pp.489,490.

49. ibid., ,p.491.

50. ibid., p.482.

51. ibid., p.496.

52. ibid., pp.496,497.

53. Whitehead, *Religion*, op. cit., p.143.

54. Pailin, op. cit.

55. Whitehead, *Process*, op. cit., p.485.

56. Ian G. Barbour, *Issues in Science and Religion* (London: SCM Press, 1966) p.448 (italics his). Similar points are made in the first volume of his Gifford lectures, *Religion in an Age of Science* (London: SCM Press, 1990).

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